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The Westinghouse Company Reaching Out.

AN IMPORTANT MOVE IN ELECTRIC LIGHTING CIRCLES—THE WESTINGHOUSE COMPANY NOW CONTROLS THE CONSOLIDATED AND SAWYER-MAN COMPANIES.

The Westinghouse Electric Company announces that it has leased the Consolidated and Sawyer-Man Companies, and will hereafter conduct the business of those two companies.

The Westinghouse Company has heretofore been a large stockholder in the Consolidated Company, but by this arrangement will hereafter have the absolute control of the lamp trade heretofore conducted by the Consolidated and Sawyer-Man Companies, and will be able to manage it in the direction of the extension of its already large business of the manufacture of dynamos and incandescent lighting apparatus. The company now has factories of a capacity sufficient to manufacture seventy-five hundred lamps daily, and its trade, which has now become as important as any of the electric light companies, it is expected will be greatly augmented by the superior quality of the lamps it will now manufacture. The Westinghouse Company has recently secured improved processes for the manufacture of lamps whereby they announce that a larger amount of light is obtained from a given expenditure of power than has heretofore been guaranteed by any of the companies, and the improved lamp, together with the reduced cost of manufacture, will enable that company, with the large trade it now commands, to make a considerable reduction in the cost of incandescent lamps to users.

It has been ascertained that the terms of the lease are of a character that will ensure to the stockholders of the Consolidated Company dividends of six per cent. per annum, placing the stock of that corporation on a paying basis.

Thomson-Houston System of Street Lighting by Incandescent Lamps.

The adaptability of the Thomson-Houston system to conditions of lighting which can exist in actual practice, makes it possible for central stations operating that system to furnish, in addition to the arc, series-incandescent, direct low-tension incandescent, compensator and transformer systems, already so well known, a system of street lighting by incandescent lamps which possesses peculiar features of excellence.

The Thomson-Houston Incandescent street system is adapted to the peculiar conditions which exist in suburban towns and in cities which have had the good fortune to retain any foliage in their streets.

This system has already proved itself to be a valuable addition to the other methods of distribution already in use by the Thomson-Houston people. In Malden, Mass., there are 360 of these incandescent lamps of 25 candle power. Extension fixtures have been placed on the old gas posts, and the light is distributed most satisfactorily through the shady streets of that beautiful suburb. This same system is in use also in Newton and Watertown, Mass., West Point, Va., Melbourne, Australia, Osaka, Japan and elsewhere.

As to the electrical arrangements of the system, they are simple and efficient. The dynamo is of the same type as that used for the transformer system of house-to-house lighting and maintains between its terminals a difference of potential of 1,000 volts. Its capacity is for three hundred and twenty 25 c. p. lamps. The current on leaving the dynamo passes through a switch and a bank board containing a group of relief lamps. There are forty lamps in each circuit between the terminals of the dynamo, and if one of these lamps goes out, thus bringing the current up above its normal strength, a relief lamp is switched into the circuit until the patrolman has replaced the broken lamp wherever it may be in the street. Each series of forty lamps has its own current indicator as well.

Instead of the bank board, however, with its relief lamp and current indicator, the series of lamps may be arranged in another way, that is by the use of double sockets. Using this latter method there is no need of throwing in extra lamps at the station to keep the current at its normal strength, for if one lamp goes out its mate is automatically

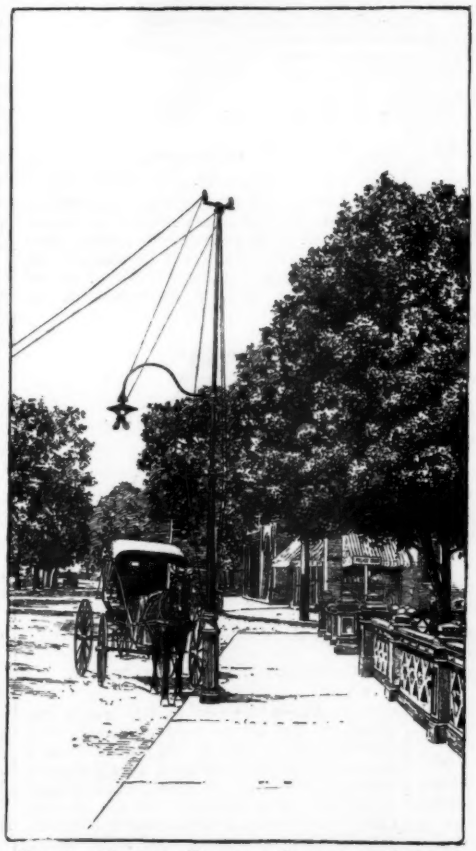


FIG. 1.—THOMSON-HOUSTON SYSTEM OF STREET LIGHTING BY INCANDESCENT LAMPS.

lighted, thus allowing no district to be left in darkness even temporarily. The second of the two lamps which this double socket carries may be colored or designated otherwise, sometimes by its relative position as being next to the pole or toward the street, so that the patrolman will know that the first lamp of the pair needs renewing. With this arrangement of double sockets as well as that of a separate wire and bank board for each group of 40 lamps, the system offers ample opportunity for the placing of house lighting transformers in connection with its lines. It is one of the remarkable and valuable features of the system that it can be used with regular house lighting service without causing the slightest fluctuation in the intensity of the house lamps. The fixtures, shades, insulators, lamp sockets, etc., are so light and simple and the wire is so small that the brackets and posts used can be very neat and unobjectionable. The accompanying cut (Fig. 1) is made from a photograph taken in West Newton, Mass., and shows a lamp post extension with its lamp and supporting a span of two wires 100 feet. The arms that hold the lamp are put on sliding collars by which the height of the lamps may be altered at will. The lamp may also be on a bracket which is simply attached to an ordinary wooden pole or to a house wall.

The double socket which we herewith illustrate (Fig. 2) is furnished with the film cut-out by the rupture of which the lamp is short-circuited. The patents on this form of cut-out are owned and controlled by the Thomson-Houston Electric Company. The life of the lamp, inclusive of breakage from accidents, proves to be considerably over 1,000 hours.

The fact that transformers can be placed on the same trunk

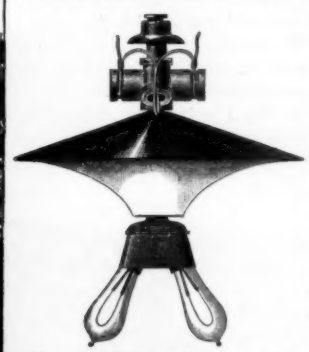


FIG. 2.—LAMP FOR INCANDESCENT STREET LIGHTING.

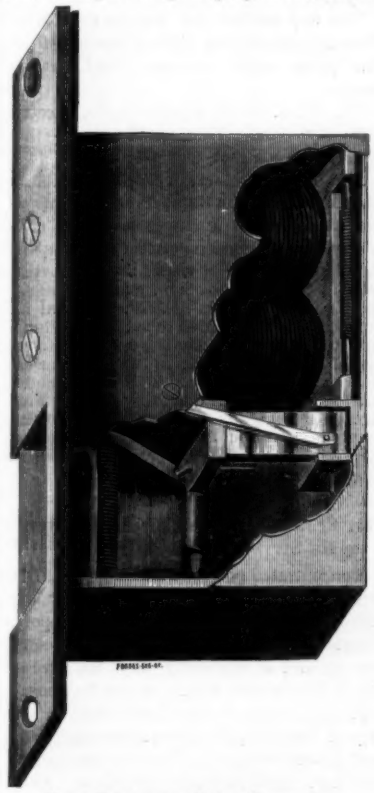
wires so that both streets and houses can be supplied by the same system, both house lights and street lights retaining their independence, neither affecting the other, constitutes for this system a marked advantage.

—— The United States Electric Lighting Company has secured the contract for lighting the new Iroquois Hotel and the Buffalo Library Association at Buffalo, New York. The plant will be a large one, comprising about 2,200 incandescent lamps for the hotel and 300 for the library. Two 100 horse-power Rice engines are used.

*** The Hudson River Telephone Company's nineteenth dividend due October 15, will be 1¼ per cent. The stock has heretofore paid 6 per cent., but improvements in the wires have reduced it.

The New Electric Door Opener of Messrs. Hazazer & Stanley.

This door opener is of substantial construction and calculated to withstand the wear and tear incident to use in an apartment house. Externally it is like a mortise lock, having no irregular projections, and is



NEW ELECTRIC DOOR OPENER.

therefore easily applied. Being completely enclosed all dust and plaster is excluded, and as the working parts are of hard metal and unoxidizable, its reliability when once placed in position is assured. Its action is such as to admit of a heavier pressure, the manufacturers claim, than any other door opener in the market. The connecting wires are placed between the lugs and the door jamb, one wire in contact with the lug and the other in contact with an insulated washer.

The many advantages to be derived from a positive electric door opener our readers will readily appreciate, and we have no doubt the one presented in the REVIEW will be found to be a valuable addition to the best electrical conveniences.

A Horse Railroad Company Refused a Franchise.

The Common Council of Plainfield, N. J., have again refused a franchise to a street railroad company. A petition was presented at the July meeting of the council, signed by many of the leading taxpayers, asking for transportation facilities. A special committee was appointed to consider the matter, and they made a report at the last meeting. The franchise was refused to the present applicants, a horse railroad company, but a recommendation was made in favor of a cable or electric road in case application for a franchise is made.

The Electric Railway in Topeka, Kansas.

Mr. J. B. Bartholomew, president of the Rapid Transit Railway, informed a Topeka *Capital* reporter that their company had completed arrangements to put the electric system on their line and take off the steam motor. The contract has been closed and work will begin in a few days on the new plant.

"The company has for a year or more been investigating the various systems of street railways with a view of securing the best in the land," said Mr. Bartholomew to the reporter. "We have inspected the workings of everything that is made for the propelling of street cars, and we are satisfied beyond any doubt that the electric system is the best system in use at the present time. It has been thoroughly tested and it has been proven that it can give quicker service than any other power. Our steam motors have been quite satisfactory, but they can not give the quick service that the increasing travel of our road demands. We will have a 600-horse power central plant and will operate 50 cars. This will be the longest electric street railway in America. We hope to have a portion of the system in operation by January 1."

The city council has granted the Rapid Transit Company the right to operate their line by the electric system instead of steam motor.

Mr. W. J. Clark represents the electric company — the Thomson-Houston — that secured the contract.

Mr. J. G. Slonecker, of Topeka, secretary and attorney of the Rapid Transit Company has always been a strong believer in electricity as the proper power for his company to adopt, and was a visitor at the REVIEW office several months ago, while investigating electric systems in the east. He and his company finally decided to accept the Thomson-Houston system, and we expect to see one of the finest electric railway systems in the country soon in operation in the enterprising and beautiful city of Topeka, Kansas. The company has agreed to have five cars in operation January 1st, 1889. The road is fourteen miles long, and will be the longest electric railway in the country.

Mr. Frank Ridlon on Electric Power—He Strikes a Prophetic Vein.

Concentrated power is a monopoly. Distribute the same in small quantities—and to many users—and you prevent monopoly. This is what an intelligent community wants. By the aid of electricity they can have it. As an illustration of how it can be done, I will quote what is now being done in the city of Boston by the Baxter Manufacturing and Motor Company. They are distributing power in small and large quantities. Even so small as that require to run a small watch lathe operated in the office of the Waltham Watch Company. From the size used for this purpose, which is one-tenth of a horse power, they continue manufacturing the various sizes up to 25 horse power. These motors are used in running everything which is in commercial use requiring power, such as coffee mills, sewing machines, blast and ventilating fans, lathes, printing presses and elevators of all sizes. It has been suggested that it is not impossible for the electric power to bring about a revolution in mechanical industries by taking power to the workman instead of compelling the workman to come to the power, thus preventing his loss of the time consumed in travelling to and from his labors and dividing among the many what is now under the control of the few. This, when you look at it, does not seem improbable, as the careful observer can see the curtain slowly rising and bringing to view an age in which the advancement of mechanical industry has never before taken such a prominent part. To what this will lead, many of us now taking an active part in electrical work will not live long enough to know. The electrician of the present can only hope to be remembered for the crude discoveries which he made in the early days of the science. For the present it must suffice that our progress is onward and upward; meeting difficulties and overcoming them to the best of our limited knowledge, leaving our dreams to be accomplished by those who come after us. And no doubt could we turn back to this world at the end of a future century, we should be as much surprised as would those who passed away 50 years ago were they to come back and witness what we have accomplished at the present time. FRANK RIDLON.

Boston, Mass., Oct. 6th.

The Marshall Condensers.

In this branch of electrical work, requiring great skill and accuracy, Mr. Wm. Marshall, of New York, has won a position of which he may well be proud. It is a branch of the business wherein few excel, and Mr. Marshall has the satisfaction of knowing that the instruments he manufactures are endorsed by the ablest electricians of the country. We have seen a number of expressions of appreciation of his work in various letters and publications, from one of which we publish the following, by Mr. Wm. Maver, Jr.: "Much credit is certainly due to Mr. Marshall for the high state of efficiency to which he has, practically unaided, brought his standard condensers. It is well known to many that his condensers are fully equal to those of the best foreign make, both as regards accuracy and retention of charge, and this latest improvement in the manner of connecting the plates renders them superior to the latter in respect of the possible variations of capacities with a given number of sections."

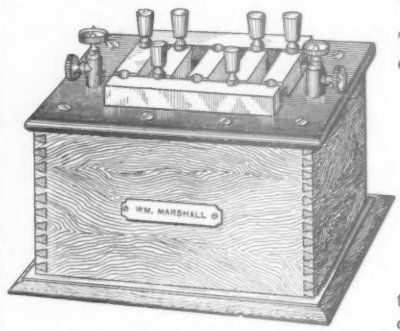


FIG. 3.—MULTIPLE ADJUSTABLE CONDENSER.

We are pleased to present views of a number of the condensers and other instruments manufactured by Mr. Marshall.

In Fig. 1 is shown a standard condenser which has a total capacity of one micro-farad, divided into ten sections of one-tenth each. Fig. 2 is one with a capacity of four micro-farads, divided into twelve sections, one of ten sections of one-tenth each; one section of one micro-farad, and one section of two micro-farads. Each section, it is important to note, can be used independently, and at the same time if necessary. Fig. 3 shows the old form which can only be used in multiple. In Figs. 4 and 5 are shown the round and square forms of non-adjustable standard condensers, which are arranged with capacities of from ¼ to one micro-farad each.

The condenser shown in Fig. 6 is the non-adjustable, ordinary condenser and is the style used largely by the telegraph companies, phonoplex, etc. Fig. 7 is the adjustable condenser of similar form. Figs. 8, 9 and 9*a* show forms of small condensers used largely for telephone purposes. In Fig. 10 is shown the pocket standard condenser.

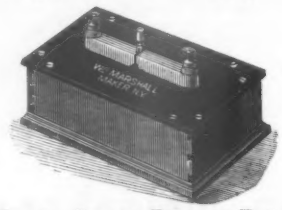


FIG. 5.—SQUARE FORM OF FIG. 4.

Figs. 11 and 12 represent resistance boxes. The first has a total resistance of 100,000 ohms, divided into four coils of ten, twenty, thirty and forty thousand ohms each, and can be used as a bridge. Fig. 12 has a resistance of 100,000 ohms divided into two coils of fifty thousand ohms each.

FIG. 4.—NON-ADJUSTABLE STANDARD.

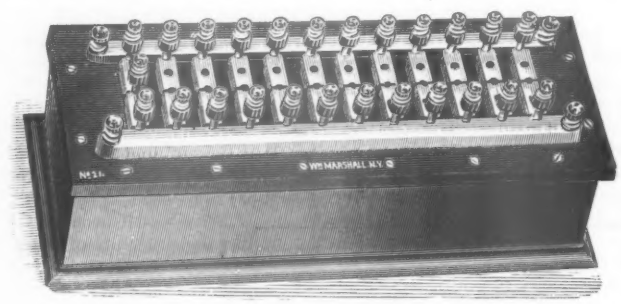


FIG. 2.—SAME WITH CAPACITY OF FOUR MICRO-FARADS.

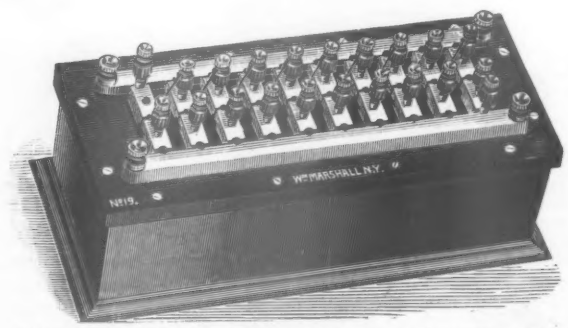


FIG. 1.—MARSHALL'S MULTIPLE SERIES ADJUSTABLE STANDARD CONDENSER.

The New Electrical Transfer Table at Altoona.

The plans for the new transfer table to be erected by the Sprague Co. at Altoona for the Pennsylvania R. R., have been completed. The table will be used to convey cars from one track to another and will be able to serve 30 tracks. The table itself is 60 feet long and 17 feet wide; it contains one track and a platform for the workmen. It is supported by four trucks resting upon eight rails. The motion is imparted to the table by a Sprague Electric Motor of the railroad type, flexibly suspended at the center between the two middle trucks and geared to the four outside wheels. The current is conveyed to the motor from a dynamo situated in the main repair shop by conductor running underneath the table and at a height of 14 inches above the ground. From this conductor the current is taken by a trolley wheel pressing against its underside. The speed of the motor will be governed and the table started and stopped by means of a Sprague patent switch on the center truck. This switch throws the winding of the field into different combinations, thus altering the power and speed without the use of any idle resistance.

A very similar table to this was erected some time ago by the Sprague Co. at Aurora, Ills., for the C. B. & Q. R. R. This table has worked very satisfactorily since its installation, and the order for the one at Altoona is a direct result of its success.

OUR KANSAS CITY LETTER.

(Special Correspondence.)

The Edison Company expects to have its building completed by November 15th at the latest and to have the plant in operation by December 1st. The contracts have been let for all parts of the building and plant. The Edison Machine Works will furnish the dynamos; the Edison Lamp Company, the lamps and patented indicator; Bergmann & Co., the electrical apparatus and meters; the New York Safety Steam Power Company, the engines; Babcock & Wilcox, the boilers. The foundations are solid and massive and are intended to become finally the resting place of a building of ten or eleven stories. At first, however, only the first story will be erected. This building is the result of a plan originating three years ago with Mr. E. R. Weeks and others of the Kansas City Electric Light Company and others outside of that organization. It was found difficult, however, to raise money sufficient for a plant of the capacity that the projectors thought would be sufficient. A half million dollars would be required for the building they desired to erect. The failure of a number of electric light companies throughout the country and the local agitation of the question of putting all electric wires underground, caused capitalists to consider such an investment a rather risky one or at least one that would not be very profitable. Then the Edison Electric Light Company was formed. Its franchise was obtained only on the condition that two miles of its wires should be placed underground. The new company leased the lot, which the projectors of the new building had purchased, and are now carrying forward to a certain extent the original plan.

The building will be fitted up with a plant, at first, of a capacity of 6,000 lights. This will be steadily increased until a plant of a capacity of 30,000 lights with twelve 200 h. p. engines, seven boilers and other machinery in proportion, the total value of the plant alone being between $75,000 and $100,000. The building will be put up, at present, only as far as the first story, but it is expected that other stories will be added until the original plans are fully carried out.

Mr Weeks is of the opinion that the transmission of electrical power will be of almost equal importance to that of furnishing electric light. The company will furnish motors and operate them by electricity from this plant. He says a number of applications have already been made for power, although it is not generally known yet that the plant will be prepared to furnish power. An Edison meter will be used and the Edison Company will know exactly how many lights the customer uses, and how long he uses them, and how much electricity is required for his motor. Mr. Weeks says he is tired of having patrons do their own measuring. Mr. Weeks says that all the wires near the station and all along the main thoroughfares will be placed underground. "We would place all our incandescent wires underground," said he, "if we could do so without destroying our profits." The new plant, when in operation, will be run night and day and will give employment to about 60 men.

The Kansas City Electric Light Company is considering plants for an additional story to its building, which will be devoted hereafter, exclusively to arc lighting. If the new story is added, the capacity of the plant will be increased to 2,000 arc lights.

The Interstate Electric Company is established in its new offices in the Keith & Perry building, one of the handsomest business blocks in the West, but its plant in the basement is not yet in working order but soon will be. The old plant of the company is kept busy now but will soon be closed down after the new plant is ready. An Ideal engine and a Fort Wayne Jenney dynamo are in position and the building is wired.

Mr. H. W. Smith, of St. Louis, the inventor of the electric cable signal, is in the city and has two signals on trial, one at the Main street crossing of the Metropolitan Company's Fifth Street Line, and the other

at the crossing of the Metropolitan's Twelfth Street Line and the Walnut Street Line of the Grand Avenue Cable Company. As a car approaches the crossing it comes in contact with a wire completing a circuit and causing the ringing of a gong and the illumination of the warning: "Look out for the cable car." At the Twelfth and Walnut street crossing, by means of a light for each line enclosed in the one glass case, the signal silently and automatically announces which car has the right of way if a car should be approaching on each track at the same time. The car nearest the crossing will turn its light on first and that will be seen by the gripman of the other car. Thus if a Twelfth street car is in advance, its light, behind blue glass, is turned on. If the Walnut street car is nearest, its light, behind red glass, is turned on. It is thought the Metropolitan Company will adopt the signals for use at all its street, cable and railroad crossings, at least, that is what the citizens hope.

The agitation of the question of the reduction of telephone rates has about died a death for the want of life. The committee appointed by the council went vigorously to work investigating the matter, but before they had gone very far they realized they could be engaged in many more things that would be of greater value. Nevertheless, they kept at it, developed the fact that the charges in Kansas City were just as reasonable as in any city where the telephone was used, and that they were much more reasonable than in some cities. It is hardly probable that the report of the committee will be such an one as will call for any action on the part of the council. Mr. Lee, the chairman of the committee, has stated that while he was in favor of doing anything that would help Kansas City he did not want to do anything that would make a nuisance of the telephone. In Indiana the legislature had enacted a law making $3 per month the maximum rate a telephone company could charge, he said. The latter had retaliated by charging for each message sent over the wires and had adopted the rule of taking out the instruments when they did not pay $15 a quarter. As a result the number of telephone instruments in Indianapolis had decreased from 1,200 to 700. A comparison of the rate charged in Kansas City, $72 per year for business houses and residences alike, with those charged in other cities of a proportionate size, does not prove the former to be unreasonable. In Milwaukee, where there are 2,000 instruments, the rate is $60 to $130 for offices and $42 to $60 for residences, but the company pays into the city treasury 1½ per cent. of its gross receipts. In Minneapolis the rate is from $40 to $120, depending on distance and whether on private line or circuit. In that city an attempt was made to reduce the rate, but it failed. Mr. Lee's correspondent announces that they will try again, however.

Alderman Finlay has returned from a visit to New York convinced that the underground system of stringing electric wires is a success. A number of engineers of New York and Brooklyn have assured him that conduits would be a success in this city. Two petitions for a franchise for the construction and operation of a conduit system in this city have been in the hands of the Board of Aldermen for many months. If Alderman Finlay will take time from his business of electing a President to attempt to infuse some of his enthusiastic belief in the conduit success into his Aldermanic colleagues it is probable that something may be done in the matter by next spring.

The Kansas City agency of the Thomson-Houston Company has secured the contract for 1,500 lights for the Wichita, Kan., Incandescent Electric Light Company. The contract calls for 1,500 more lights when the plant is fully underway and in successful operation.

The Southwestern Electrical Supply Company has secured exclusive control for the West of the W. L. Libbey & Son Company's (Toledo, O.), globes and shades. The Southwestern reports a big business in motors and wire.

The Western Electrical Construction Company reports, through General Manager Bates, that work has begun on its extensive contract at Pine Bluff, Ark.

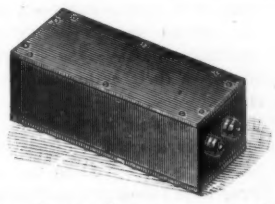
KAWSMOUTH.

KANSAS CITY, MO., Oct. 3, 1888.

Electric Acupuncture.

The Chinese, we are told, employed acupuncture at least 4,000 years since, and the Japanese adopted it long ago. Their practitioners employed puncturing needles of gold and silver, and their manufacture was an art of great importance. They were of different shapes. Some bladed like swords, and others of the ordinary needle form. At the end of the eighteenth century acupuncture was introduced into Europe, and was developed in the present century. M. Gaiffe, a French electrician, has recently constructed a variety of needles for electric acupuncture, specially applicable to the perforation of painful tumors, so as to avoid unnecessary pain. By the electric acupuncture the current is conveyed into the tumor and applied at the point where it is most required to affect the dissolution of the morbid liquid contained in it. For this purpose the blade is varnished, except at the point, and thus insulated, so that the current only escapes at the point. Glass or india rubber has been used to coat the needle, but insulating varnish is preferred, since it does not thicken the probe so much. The upper end of the needle is connected to one pole of the voltaic battery used, and there is a conducting-plate applied to the skin, and connected to the other pole. When, therefore, the needle is forced into the tumor the current flows from its point to the conducting-plate through the flesh, and decomposes any unhealthy fluids there may be in its passage. This process aids the absorption of these secretions and the destruction of the tumor.

FIG. 11.—MARSHALL'S RESISTANCE BOX.



FIGS. 8, 9 AND 9A.—SMALL CONDENSERS FOR TELEPHONE USE.

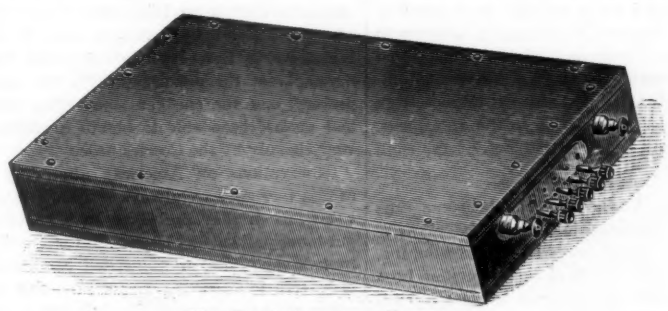


FIG. 7.—ADJUSTABLE CONDENSER.

FIG. 6.—MARSHALL'S CONDENSER FOR TELEGRAPH PURPOSES—NON-ADJUSTABLE.

Petroleum Used for Fuel.

It will be remembered that this question was discussed at length at the recent meeting of the National Electric Light Association.

The engineer at the Day Cordage Company's works, at East Cambridge, has used petroleum for fuel in his boilers for about two months, and says it is much preferable to coal. There are no ashes nor coal to shovel, the heat can be regulated more easily with the new system than with coal, and there is less wear on the furnace. The crude oil is pumped from the oil works close by into a large iron tank just outside the boiler house. A gauge in the boiler room, officially inspected and certified to, informs engineer as to the supply of fuel on hand, and affords a ready means to measure the oil from time to time pumped into the tank. An exhaust pipe from the engine is carried through this tank, and the oil thereby kept warm, in which condition it is more readily vaporized for burning. An air compressor subjects the oil to a high pressure, which forces it through jets in a vapor that resembles steam, the supply being regulated for each jet by a separate valve. This vapor of oil, when burning, gives an intense and a uniform heat. Three such jets serve to run the two eighty-horse boilers at the cordage works, consuming, when the works are running at their full capacity, about 375 gallons of oil a day, and giving steam to run an engine of one hundred horse-power, several pumps, and also to heat the tar-house.

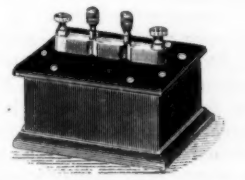


FIG. 12.—ANOTHER FORM OF FIG. 11.

FIG. 10.—POCKET STANDARD.

Norfolk, Va.—The Norfolk Electric Power Company has been incorporated, with Geo. E. Bowden president.

Albion, Mich.—The Albion Electric Light Company, of Albion; capital, $25,000; Samuel V. Irwin and others incorporators.

Dayton, O.—The Electrical Manufacturing Company, Dayton, Ohio; capital, $20,000; John R. Fletcher and others incorporators.

Chicago, Ill.—The Combination Electric Chair Company, of Chicago; capital, $100,000; Nels. Sorenson and others incorporators.

Troy, O.—The Troy Silver Electric Light and Power Company, of Troy; capital, $15,000; Geo. D. Ryder and others incorporators.

Jersey City, N. J.—The Magneto-Electric Machine Company, Jersey City; capital, $150,000; Robert D. Murray and others, incorporators.

Medford, Wis.—Electric Light company, of Medford; capital stock $3,000; incorporators, Joseph Brucker, A. J. Perkins and Jacob Shopine,

Chicago, Ill.—A certificate was filed to record the increase of the capital stock of the Central Electric Company of Chicago from $10,000 to $50,000.

Cincinnati, O.—Electric Company, capital stock $20,000, filed articles for incorporation yesterday in the office of the Secretary of State at Columbus.

Chicago, Ill.—The Dieckmann Electrical Company, at Chicago; capital stock, $100,000; for the manufacture of electric machines and apparatus; incorporators, G. F. Dieckmann, Christian Wahl and David Quigg.

Washington, D. C.—"Columbia Conduit and Cable Company"; capital stock, $500,000. The incorporators are A. D. Hazen, William R. Riley, I. L. Johnson, L. Somerville, O. T. Thompson and William A. Thompson.

Camden, N. J.—The Natural Gold Sulphuret Amalgamating Company; capital $1,000,000 is stated to be fully paid in. The incorporators are Edward H. Graham, Geo. B. Collier, John Hunter (trustee), and John T. Woodhull.

Chicago, Ill.—The Tubal Cain Brass Manufacturing Company, at Chicago; capital stock, $75,000; for the manufacture of brass, iron and copper goods; incorporators, J. H. Lehnre, J. H. Johnson, F. A. Hoyer, T. M. Kent and C. D. Street.

Montreal, Can.—The Imperial Electric Light and Traction Company, of Montreal, has been incorporated by R. D. McGibbon, James Leggatt and M. D. Barr, of Montreal, and Wm. Bracken and S. D. Hatch, of New York City; capital stock, $300,000.

Gardiner, Me.—The New England Phonograph Company at Gardiner, with a capital stock of $2,000,000; amount paid in, $400; par value of shares, $100. The stockholders are John B. Gleason, New York City; George L. Rogers, Z. Frank Little and James H. Douglass, Gardiner, Maine. John B. Gleason is president, George L. Rogers treasurer. The purposes of the corporation are to manufacture and sell machines in New England States.

Buffalo, N. Y.—A preliminary certificate of incorporation of the New York Water and Electric Supply Company, limited, of Buffalo, was filed with the secretary of state. The company proposes to construct water and electricity supply plants for municipalities and private parties throughout the United States. The capital stock is to be $15,000 divided into 150 shares. The incorporators are Robert Palen, Augustus Dowdell, Millard S. Burns, Charles D. Armstrong, Thomas M. Mitchell, Jr., and George N. Pierce.

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NEW YORK, OCT. 20, 1888.

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The Edison Company has been granted a franchise in Brooklyn, after a hard and long fight. Work will commence at once.

The Johns Hopkins University now announces the opening of an electrical testing bureau. Reliable and accurate work may always be expected.

The electrical field has never, to our mind, been as full of rumors concerning large company consolidations, important re-organizations, etc., as at present. It is always wise to make haste slowly in these matters.

Mr. Wm. Lee Church, the eminent engineer, is arranging to spend the winter months in the South, and enjoy a well-earned rest. Mr. Church is one of the most active and well-informed gentlemen in steam engineering circles, and numerous friends will wish him a very pleasant visit in the South, and in this the REVIEW most heartily joins.

Electric light poles costing from $200 to $300 each, such as are now in use in Berlin, would strike the average electric light man as extravagant. Yet when compared with some subway schemes, we think they would be found to be economical, if their freedom from underground legislation could be assured. And, besides, what an improvement in the line of beauty they would be over the present pole lines!

It would seem as if those two genial and able men, President Henry C. Davis and Vice-President E. T. Gilliland, of the Electric Club, are determined to do their share towards having this little globe of ours retain its equilibrium. Mr. Davis spent several months in Europe early in the year, and the day he sailed for New York, Mr. Gilliland started for London; now it is announced that Mr. Gilliland will arrive here in November and by that time Mr. Davis will reach the other side of the globe. We wish them success in their considerate efforts, but would prefer to have them both with us, as would all of their other American friends.

Mr. H. C. Davis retires from the presidency of the Sawyer-Man Electric Company to devote his time chiefly to managing the large estate left by his father, whose death we announced a few months ago. For nearly four years Mr. Davis has been at the head of the Sawyer-Man Company, and by his ability, great industry and the strictest integrity, has won a conspicuous and enviable position in electric lighting circles. The REVIEW extends to Mr. Davis its most sincere and cordial well-wishes, and is sure that it is a matter of pleasure to all his friends in electrical circles to hear that he still retains large electrical interests.

In the District Supreme Court in Washington, last Monday, in the case of J. Harris Rogers against A. H. Garland, Joseph E. Johnston, *et al.*, the demurrer entered by all of the defendants except Attorney-General Garland was overruled and the defendants were required to answer. The Chief Justice referred to the charge that the plaintiff had been refused information as to the condition of the affairs of the company, and was of the opinion that he was entitled to an accounting. Mr. Garland in his answer under oath denied the allegations of the bill; consented to an accounting by the Executive Committee for all sums realized by Rogers from sales of stock in violation of the agreement. The decision requires that defendants shall now answer.

Mr. Allan V. Garratt, who for some time has been connected in an editorial capacity with that bright electrical contemporary, *Modern Light and Heat*, and who has been identified with the progress of the electrical science in Boston all the way along, is to leave Boston for New York. He is no longer a newspaper man, but the secretary and treasurer of the National Light Association. Only a few numbers back we concurred in the establishment of a permanent headquarters, but the idea did not occur to us at the time that we were advocating the removal of one of Boston's brightest electrical men and a courteous gentleman.

The *Bulletin* congratulates Mr. Garratt and wishes him all the success and credit to himself in his new position that he had gained by honest work in the old one.—*Boston Bulletin.*

The 28th meeting of the American Institute of Electrical Engineers, and the first of the present season, was held at the house of the American Society of Civil Engineers, No. 127 E. 23d street, New York City, Tuesday Oct. 9th. The programme of the evening was the discussion of Mr. Frank J. Sprague's paper on "The Solution of the Municipal Rapid Transit Problem," read at the last special meeting at the Institute, and which has commanded such wide-spread attention among street railway men in all parts of the world. Mr. M. B. Leonard, of Richmond, spoke at length in regard to the practical working of the road, after which Mr. Sprague, who was present, gave an account of the improvements which the Sprague Co. has made since the installation of the electric road at Richmond.

AMERICAN SKILL IN APPLIED SCIENCE.

The scream of the eagle is always a welcome sound to American ears; and it has never been heard with better effect in scientific circles in England than during the last month, when a number of American inventions were presented to the notice of the English in the course of the meeting of the British Association for the Advancement of Science. The phonograph and the graphophone have attracted and surprised all by the wonderful manner in which they could reproduce all sorts of sounds, even to the slightest modulations of the human voice. It is beyond all conception how small a quantity of energy operates these instruments, when it is considered that they will record the minute overtones which indicate the characteristics of a sound and which are beyond the power of any physical apparatus to measure.

At one of the evening lectures Professor Ayrton spoke upon the progress of electrical science; and in connection with the subject, Mr. Charles H. Fisher, formerly manager of the Chicopee Mfg. Co.,—one of the large mills near Springfield, Mass.,—and now the European representative of the process of electric welding, made an exhibition; and as two bars of inch iron were placed in the machine and rapidly brought to incandescence at their junction, even the constitutional British apathy yielded and the audience broke into applause, and as specimen after specimen of various metals were welded purely by scientific methods, the audience, in the wildness of their enthusiasm, stood upon the chairs.

Sir William Thompson, whose opinion as the greatest of electricians is entitled to its due weight, said, with regard to this process: "Never have I seen an exhibition of applied science surpassing this in interest. I can see that its outcome is to be a revolution in our industries. It does what never has been done before, and what it is impossible to do with any appliances hitherto in use."

Another paper which proved of great interest, gave a description of the application of electricity to metallurgy by the Cowles process of electric smelting, which is carried on so extensively at Lockport, New York. Large works have been established at Milton-on-Trent for manufacture by the same process, and the speaker stated that they had at last been able to obtain aluminum very cheaply by the Cowles process.

Observations on American affairs by a candid foreigner are always of the greatest value, when they are given in a spirit of pure and judicial criticism, unmixed either by fulsome praise or unmerited condemnation. No mind ever perceived the true position of America until the Frenchman, De Tockqueville wrote his book.

Professor Forbes, of London, gave the result of his two visits to the United States for the purpose of inspecting the various systems of electric lighting. The wide-spread application of electric lighting astonished him on his arrival in America, and on his return to England, the darkness from the lack of such illumination became a source of mortification to him. He stated that there were three hundred thousand arc lights and three million incandescent lights in use in the United States, and he thought the lack of comparable electric lighting in Europe was due to the legislation on the subject, which does not put electric lighting on the same basis as gas lighting.

Prof. William H. Preece, the electrical head of the post office department of Great Britain, had also recently returned from a visit to America, and confirmed many of the last speaker's remarks; but he did not believe that the lack of electric illumination in England was due to obstructive acts of Parliament, but rather to the fact that the knowledge and confidence of capitalists with regard to the subject was not sufficiently advanced to warrant a large expenditure in such an enterprise. The paper upon the electric lights of American manufacture used on the Suez Canal, gave an instance where the inventive enterprise of American industries was being pushed beyond the limits of our own country.

Professor Preece said that the Americans were ahead in technical education, and that the liberal patent laws of this country are of such a nature as to nourish invention, and cited several instances of inventions made by Americans who have been great in statesmanship. "The United States," he said, "has not set her rivers on fire, but has compelled her mountain streams to give light, life and comfort to people by turning water wheels which set dynamos in operation, and therefore generating light out of water."

The agricultural machinery of the United States is used to reap the crops throughout the whole world; and in other applications of mechanical work, American machinery is pre-eminent wherever there is an opportunity for organization of parts to perform processes for economizing labor.

OUR CHICAGO LETTER.

(Special Correspondence.)

Two Smiths are known favorably in the telephone world. One of these, who doubles the W in his name, has particular reasons, judging from the following, for feeling a good deal of pride in the work of the young ladies at the Kansas City Exchange. The figures are those of the week ending October 6th.

Calls answered, as shown by the automatic record:

Monday, Oct. 1	26,816
Tuesday, Oct. 2	24,240
Wednesday, Oct. 3	26,458
Thursday, Oct. 4	25,503
Friday, Oct. 5	24,319
Saturday, Oct. 6	29,422
Average number of subscribers	2,440
Average number of calls per subscriber per day	10.7

Much has been said in these columns at various times of the disposition on the part of the great majority of living mortals to "monkey with the buzz-saw."

A marked case of this which I witnessed on State street one rainy evening last week, made me shudder. During a very heavy downpour of rain, a lad of 14 or 15 years, walking just ahead of me, was raising his umbrella at each arc lamp as he passed beneath them, to see if he could reach them with his umbrella tip. Fortunately he failed in doing this, and was badly frightened when I explained the danger to which he thus unwittingly exposed himself.

Yet the man who wants his lamp at the entrance of a basement, wants it so low, one has to dodge it with one's head, and talks loud about usurped authority and depriving an honest citizen of his rights, if his request is refused.

A very peculiar combination of circumstances produced quite a scare at a theatre on the evening of the 11th instant. It could not have happened any other week of the season—it could not happen again perhaps in many years—or in any other combination.

To accomplish it required a piece of iron wire some ten feet long, a hole in the floor covered with dust, a ladder, and a fair amount of carelessness.

The iron wire was used in the particular play which was on to carry a phantom flame on to the stage in a dark scene. The wire to be ready was stood up in a corner on the prompt side, the lower end resting on the accumulated dust which covered a hole in the floor directly over the rheostat coils. The wire leaned against a ladder, and somebody, having occasion to climb this ladder, it is supposed touched the wire with sufficient force to send it below. It landed in such a position as to short-circuit part of the apparatus, and was immediately all aglow. The whole was over in a moment or two, but in the meantime an alarm had been sent in. There was no patron in the house, for it occurred before opening time, but the employés and the company were pretty thoroughly worked up.

The instance is given as another of those mysterious occurrences which go to show the necessity of care with mine, as well as the other fellow's current.

The Central Electric Company have increased their capital stock from $10,000 to $50,000. Their business has been very largely developed within the past year and they are doing a very handsome and satisfactory business now. They occupy a four story building with basement, and have it loaded up with all manner of electric supplies.

At last, as I am writing, I hear the cheerful jingle of a street car bell, and feel that there is rest for the weary pedestrian.

Chicago, Oct. 13, '88. C. C. H.

OUR BOSTON LETTER.

(Special Correspondence.)

The regular quarterly meeting of the New England Electric Exchange was held last Monday afternoon at the Electric Club rooms, 66 Boylston street. A large number of prominent electrical and insurance people were present when President P. H. Alexander called the meeting to order. The reports of Mr. H. B. Cram as secretary and treasurer were presented and accepted, after which Mr. Alexander made an address, first glancing at the work of the exchange during the past few months. Similar institutions are being established in Cincinnati, Chicago and Kansas City. Up to date 128 applications have been made for licenses, and a few statistics in this regard will not be out of place. Eighty of the applicants have already been examined, and licenses granted to 77; 49 received the grade applied for; three received a higher grade; 33 received a lower grade; three were entirely rejected. The president next gave some interesting information concerning the boards of examiners, plan of licensing, etc. Examinations are held in Boston nearly every week, and have been, or will be held in New Haven, Ct., Springfield, Mass., Rutland, Vt., and Waterville, Me. The legal aspect of affairs was next touched upon. The legality of the exchange, and its methods of licensing having been questioned, the directors have asked legal opinion on the matter, and counsel confirms the action of the exchange in every respect. In closing, the president paid a tribute to the efficient work of Secretary and Treasurer Cram, and welcomed the representatives of the Insurance Exchange.

A letter was then read from Prof. Wm. A. Anthony, of Manchester, Ct., containing valuable suggestions as to the grades of licenses, and showing the deep interest felt by him in the success of the exchange. Mr. A. L. Rohrer presented a suggestion from the Board of Examiners, in regard to certain changes of qualification and classification deemed advisable.

The two communications were then put before the meeting, and in the discussion which followed, Professor Anthony, President Alexander, Mr. W. S. Hill, Mr. H. C. Spaulding, Mr. S. E. Barton, Mr. E. F. Pond, Mr. Griggs, Mr. E. L. Caldwell, and others took part.

A motion by Mr. Cram, that in the plan of licensing, the reading of the third-class license shall be changed to read as follows: "Third-class licenses shall be issued only to persons fully competent to do electric light and power wiring, and who are incompetent to operate electrical machinery." The motion was carried.

Professor Anthony proposed a resolution: "*Resolved*, That the New England Electric Exchange apply for a charter of incorporation." The resolution was passed, and a committee, consisting of Messrs. Griggs, Robinson and Hill, were appointed a committee to take steps in that direction.

Upon motion of Mr. Hill, it was decided to place a telephone in the office of Secretary Cram for his personal use and the use of the exchange. Meeting then adjourned.

The matter of a new club house for the Electric Club will doubtless be settled in a few days. The regular Wednesday evening talks will be resumed next Wednesday evening, October 17th, when Mr. J. C. Wilson will exhibit and describe the new police signal boxes now being so extensively introduced in this city.

The Daft street car system is being talked of in Woonsocket, R. I.

Louis C. Bass, of the Woonsocket Spool and Bobbin Co., was a Boston visitor last week.

Mr. H. B. Prindle of the Thomson-Houston Company, is attending the Convention of street car men in Washington this week.

Harry L. Lufkin of the "C & C" Motor Co., spent several days at the Hub last week visiting the Electric Club several times. He expresses himself as well pleased with the success of the New England "C & C" office.

Boston, Oct. 13. T. W. S.

In reply to several queries would say that the little pamphlet entitled "Stress Tables," edited by Mr. H. D. Stanley, is published by the Bridgeport Brass Co. and will be sent free to all who write this company at Bridgeport, Conn.

OUR PHILADELPHIA LETTER.

(Special Correspondence.)

Since my last letter, electrical business, in the city of Philadelphia and its vicinity, has not been of sufficient interest to invite much notice; but with the return of the dark days of autumn, a very different state of affairs has to be chronicled, as is evidenced by the number of sales of apparatus set forth below, all of which have been consummated within the past week.

M. R. Muckle, Jr. & Co., agents of the Westinghouse Company, have sold the following:

I. The large paper manufacturing firm of C. S. Garret & Son, whose works are located at Cobb's Creek, Pa., have purchased a plant of 100 incandescent lights of the Westinghouse type, and for power a Westinghouse "Junior" engine.

II. The Washington Architectural Iron & Bridge Works, of Washington, D. C., have taken an outfit consisting of 150 lights and an engine of the same make to drive them.

III. J. W. Bowman, of Oxford, Pa., who controls the electric lighting plant of that thriving town, has just given an order for an increase of 150 Westinghouse lights, with all the accompanying apparatus, and an engine of sufficient capacity to run the plant. He has previously bought another Westinghouse plant and also one of the Sawyer-Man type for isolated lighting.

IV. They have also sold to Mr. Claus Spreckels, to be used during the construction of his mammoth sugar refinery in this city, a 25 light arc plant, with the accompanying 25 horse power engine.

V. The Dodge Coal Conveying Company have purchased from them five 50 horse power Westinghouse engines for use at the docks of the Pennsylvania R. R., at South Amboy, N. J.

VI. Messrs. Strawbridge & Clothier, of Eighth and Market streets, in this city, have just ordered from them an additional plant of 650 lights, making 1,950 in all of the Westinghouse system used by this firm, in addition to the 250 arc lights of the Jenney system (Fort Wayne).

These six items give a very good idea of the popularity of Muckle & Co., in this neighborhood; and by the way, speaking of the last named plant, it would do any believer in electric lighting a heap of good to visit the Strawbridge & Clothier dynamo room on Filbert street, above Eighth, for the whole outfit is a model of its kind and in every way demonstrates that the installation was not only perfect, but that the greatest of care is concentrated upon keeping the whole plant up to concert pitch.

Meanwhile, the other systems have not been idle, and, as is fair to presume, the Thomson-Houston, of the arc companies, comes to the fore and "bobs up serenely" with the capture of the town lighting plants of Erie and Pottstown in this State, besides, amongst others, the isolated installations of 50 lights each for the large wholesale houses of Young, Smyth, Field & Co., and Wood, Brown & Co., on Market street, Philadelphia. These last two sales are jointly due to the excellence of the apparatus, and to the persuasive abilities of Mr. Richmond, who is spoken of as the future manager of the Thomson-Houston Company, when our genial friend, Edwin M. Mullen goes up higher—I don't mean celestially, but in the way of corporation advancement. I am particularly glad that Cloud has been able to conclude the Pottstown sale noted above, for both he and your humble servant worked the field, almost to fruition, just three years ago this month, and while the harvest was not then ripe, it is a gratification to know that the labor was not in vain and that the husbandman who "continued instant in prayer" has met his reward in a bountiful crop.

For the same reason, I am glad to note the prosperity of the plant at Camden, N. J., to which an increase has been made in its arc system (Thomson-Houston) recently, and I learn that this will shortly be followed up by the introduction of alternating current apparatus from the same source.

Wilbur, of the Fort Wayne Jenney, tells me of an isolated arc plant which he has recently secured in the same town, namely, one of 25 light capacity for the large establishment of Mr. Vansciver.

A central station incandescent plant for Cape May, N. J., is one of the early probabilities, and I learn that an electric railroad at Bridgeton, N. J., presumably under Thomson-Houston auspices, will shortly be under construction.

The Keystone Light and Power Company, of this city, recently applied to Judge Allison for a peremptory mandamus to compel the Electrical Committee of Councils to grant them the privileges sought for to lay their underground wires in this city, but the judge, with his natural conservatism, decided to give the committee a chance to pass upon the question voluntarily, and elected to wait a short time for them to act; if they still ignore this very marked hint, there is no doubt that the mandamus will issue, and the Keystone be given the rights to which they have long been entitled. S. H.

Philadelphia, Oct. 15, 1888.

AMERICAN INSTITUTE FAIR NOTES.

"Whar do the light come from?"

The man who asked this question stood looking upward at a number of little incandescent lights protruding from the wall, poising a pair of steel-rimmed spectacles with one hand, and firmly grasping an unusually large umbrella with the other.

A stranger by his side heard the question, and, after studying the lights for a few moments, pointed to the 250 h. p. engine just beyond, and "guessed they come from that."

The man buttoned up a black coat that almost touched his heels, pushed his black felt hat squarely onto his head, made sure his umbrella was safe, and then hurried over to the engine. The engineer was eating his supper, sitting by the cylinder. He turned his head at the question asked him, and struggled violently to swallow a great mouthful of sausage and potato, but could not; so, in lieu of an answer, he made a jerky movement with his thumb over his right shoulder at the big fly-wheel, now stopped, turned his head in the same direction for a moment, made a circular motion with a potato on a fork, winked one eye, and went on with his dinner.

The man went up and prodded the motionless fly-wheel with his umbrella as if to get his bearings, looked at the lights again, then at the engineer, and turned them once more on the fly-wheel.

"Beats all b'gosh!"

He said this aloud, took off his hat, scratched his head ruminatingly, took a hasty inventory of his belongings to see if they were all there, and went back to a little enclosure, where an attendant explained to him that a very small part of the power developed by the great engine was used to work a machine that generated the electricity, and he pointed to a dynamo near by.

"Then this here machine is a-settin' these lights a-goin', though it hain't a-goin itself?"

"Not exactly. You see, when it was going this morning it charged those little boxes you see up there;" and he pointed to a secondary battery arranged along a shelf.

"But that ain't a-goin nuther!"

"It has no perceptible movement, but it's going all the same."

"Maria-a-a-a!" called the visitor to a tall, thin woman who had been following him around with eyes turned wonderingly upward. "Maria, I've got it now. They dig coal out'n the ground to put under the boilers over there; that makes the engine go; the engine makes them tea caddies on the shelf yonder go, which makes the lights go!"

"Reminds me of Jack and the Beanstalk," said Maria.

"Durned if it don't!"

The voltaic arc lights arranged about the great hall are part of the plant of the Waterhouse Electric and Manufacturing Co., of Hartford, Conn., a plant which is attracting a deal of attention because of its precision and economy; the lights requiring scarcely two-thirds horse-power per lamp of 1,700 candle-power (eight and one-half amperes). The lamps do not require fine adjustment a great desideration, and all contain the same form of regulating magnet. Nor do they need any glycerine nor dash-pots. The automatic cut-out mechanism, hand switches and arrangements for easy trimming, seem reliable. The lamp magnet is an iron core, quadrangular in shape, having the main and shunt-circuit coils arranged at an angle from each other; the magnetic effect on the iron core made by the currents flowing through these circuits is a decided novelty. So susceptible is the armature to the changes in the magnetism that the feeding of the carbon is admirably performed, so gradual indeed as to keep the carbons in nearly a relative position.

House builders and owners, and especially hotel and apartment-house people, will be interested in the automatic electric cut-off shown at the Fair. Since the introduction of power, such as steam, gas and hot-air, for pumping water for the several house services, with tanks on the roofs, many attempts have been made to find a reliable means of automatically stopping the pumping engine when the supply tank is full. The time required to watch the water through a tell-tale pipe is a considerable item and to allow the water to flow through the waste pipe is a costly waste of power. Tell-tale pipes will rust, and scale forming in them will, at times, prevent the water from flowing freely, while wire and pulleys operated from a distance are uncertain. The automatic electric cut-off is simple, durable, economical and absolutely certain.

The electric safety stop is an ingenious contrivance that ought to be, and no doubt will be, in every factory and workshop before long. How many of the dreadful accidents to mill hands could be avoided or, at least, saved from their grewsome consequences if only there was such an appliance at hand as this. A man or woman is caught in the machinery, in the belting for instance. Death is near at hand and threatening but no one can do anything but scream or stand appalled. The engine-room is a long way off, and before the engine can be stopped, the human being caught in the belting has been carried to the rollers and torn to pieces. The electric safety stop is arranged in connection with a clutch or belt shifter in such a way that by touching one of a series of conveniently arranged push-buttons, the clutch is instantly released or the belt shifted, and the machinery run by them is stopped with but small loss of time.

The Electric Club Lecture Opening.

There will be a large attendance of the members of the Electric Club Thursday night of this week, and it is safe to say that every one who hears Capt. Zalinski's lecture will be abundantly repaid. This is the first regular meeting of the season. Regular dinner will be served promptly at 6 P. M., and members intending to dine are requested to come in as near that hour as possible.

Personal.

Mr. E. T. Gilliland is expected home from Europe by November 15th.

Mr. H. M. Byllesby, general manager of the Westinghouse Electric Company, was a flying New York visitor last week, looking after his company's growing business in this territory.

Mr. Chas. Selden, the well known electrician of the Baltimore & Ohio Railway, was a New York visitor last week, accompanied by Mr. A. Cornand, an electrical engineer of Brussels.

Mr. Eugene H. Cowles, of Lockport, the inventor of the Cowles aluminium process, which is attracting much attention in England as well as in this country, was a REVIEW visitor last week. Mr. Cowles has recently returned from Mexico, where he has been sojourning for several weeks recuperating his health.

Col. C. F. Sise, of Montreal, was thrown from a carriage, through another conveyance running into it, and three ribs broken. The colonel was riding with the attorney of his company, and in the collision was pitched out, but would have escaped without serious injury, had not the attorney followed after him and landed head-first against the colonel's ribs. The many friends of the genial colonel in the States will regret to hear of his accident, and wish him a speedy recovery.

The Standard Underground Cable Company, Pittsburgh, is sending out a neatly-bound pocket handbook of valuable information, containing price list, telegraph code, formulas, electrical terms, etc. The *Handbooks* for general distribution are bound in tough check, with rounded corners, while a few for special distribution are handsomely bound in fine leather.

Telephonic News

*** The Erie Telephone Company is rebuilding and remodelling its plant at Helena, Ark.

*** The Bell Telephone Company, of Philadelphia, are using creosoted wooden tubes in their underground work in that city.

*** New telephone cables of 62 conductors, are being put in at Quebec, and are said to have been imported from Germany.

*** The long distance telephone people are stringing additional wires between New York and Boston, the increase of business between these points demanding these facilities.

*** An electric light wire dropped across some telephone wires at Burlington, Iowa, recently, burning out one of the cables and stopping telephonic service in a portion of the city for a few days.

*** The telephone was put to a novel use in Toronto. A citizen who had been summoned to appear at the police court for breach of a by-law, finding that he would be unable to appear in person telephoned the fact to headquarters, admitting his guilt, and was fined one dollar and costs through the same medium. Now, if he only could have paid the fine over the telephone, its limit in the line of time and labor saving would have been reached.

*** The new plan in the telephone service, by which the central office is notified of the telephone number of the person wanted, is coming into quite general use, and with less objection from subscribers than might have been anticipated to so radical a change. While it is troublesome to consult the directory, there is compensation in some ways. The number system enables the central office to give a quick connection; and another advantage, especially to business men, is that persons who may be within hearing of the telephone at either end do not know with whom the conversation is had unless they chance to know the person's number.—*Hartford Times.*

*** The Sunset Telephone Company, of San Francisco, Cal., recently laid, between Market street wharf and Oakland pier, via Goat Island, a submarine cable. It consists of ten copper conductors, each heavily insulated with okonite. These conductors are made into a cable, heavily covered with tarred machine banding and hemp, and protected by an armor of 18 No. 3 galvanized iron wires, laid spirally. The weight of the cable is 20,000 pounds per mile, and its tensile strength, or breaking strain, is about 30 tons, and any ship fouling it will probably lose her anchor. This cable is intended to increase the facilities of telephone connection between San Francisco and the extensive and rapidly growing system of telephone lines extending from Oakland to nearly every town and village within a radius of over 100 miles from the city.

*** Some time ago a measure was carried to the Akron, Ohio, Council, protesting against the granting of a franchise to the Central Union Telephone Co., without stipulating therein the rents to be charged for telephones. The matter created considerable stir, but a compromise was effected whereby the telephone company agreed to place an exchange in the Sixth Ward, providing eleven new subscribers could be secured in that part of town. At present 416 phones are in use in that city, quite a number being employed in Middlebury, and the company felt that if the number of new subscribers they asked for could be procured they would feel justified in placing an exchange in that part of the city. The required number have been taken and more are to follow, and at an early date a new board will be in operation in that quarter. This will reduce the rental for instruments there from a sum which is now considered exorbitant to at least $5 per month.

Gambling by Telephone.

Two years ago the Kentucky Legislature passed a law making gambling a felony, and since then the fraternity has had a hard time of it. Some of them, bolder than their brethren, or made desperate by hard luck, have defied the law on the quiet, and there are several big poker games in Louisville. But until the past week keno has been unknown. The seductive game is now run in one place at least. The contrivance by which the game is run is a novel one, and was conceived by a mind that had the fear of the gambling act now in force in the State.

The game is operated in Jeffersonville by telephone. The way this is done is: The players meet in a large room in Louisville, the pegging board, indicator, and goose being on the opposite side of the river. The cards and chips are used here, but all the operations of the goose are in Jeffersonville, and when the combination is made the winning number of the card is immediately telephoned here to the players by a private wire over the river and connecting here. The lucky player receives the amount of his winning less 20 per cent. deducted by the operators of the game.

Alleged Electric Sugar.

A queer story of an alleged wonderful discovery by an American inventor and the practical application of it in Great Britain come from a Scotch newspaper, which vouches for its truthfulness. The discovery is of a process for refining sugar by electricity, and the inventor was Prof. Henry Friend of New York, whose death occurred, it is said, on March 10, of this year. He was so secretive, it is said, that he repelled all attempts to facilitate the working of his process by keeping the management of the machinery in his own hands, and he was so fearful that his secret would be discovered that he sent the machinery to Scotland piecemeal from different parts of this country. He gave years of labor and investigation to the process, it is said, and only his wife was initiated into his secret. At his private working room he posted a notice that it was death for anyone to cross the threshold, and when he died his secret would have been lost had not those interested in his scheme insisted that he should make a written record of his experiments for use in such a contingency.

No details of the new process are given, but it is declared that it renders the boiling of sugar no longer necessary, and thus saves much that is now wasted. The raw sugar is put into his machine, and the first batch is converted into refined product in four hours. After that the process is continuous, the machine working as long as raw sugar is supplied, and turning it into refined sugar in an hour and three-quarters from the time it is put in. Ninety-nine per cent. of the saccharine matter in the raw sugar is secured, it is asserted, and the total cost is only about 80 cents a ton.

*** The Portland, Ore., telephone exchange is increasing at the rate of ten new subscribers a month. The multiple system of switchboards has just been put in and is working very satisfactorily.

*** The Olympia and Gray Harbor, W. T., Electric Company has purchased materials for the construction of telephone lines. They have a line already completed between Hoguiarn and Montesano, and will build another line from Shelton to Olympia.

*** The telephone company's rearrangement of their South Pearl street circuit is now complete, says an Albany exchange. Thirty-two new poles have been raised, each ranging in height from 43 to 63 feet. One purpose of the company in thus replacing the old poles, some of which were but little over 30 feet high, was to lift the wires as much as possible out of the way of the firemen. Fifty or 100-wire cable have been used in places to economize space. The line of wires and poles thus improved extends from Maiden lane to the old horse car stables on South Pearl street, and includes, as far south as Madison avenue, 105 wires. From Madison avenue south the number decreases as the several distributing points are reached.

The Phonograph and Graphophone in England.

REMARKS BY COL. GOURAUD, MR. E. T. GILLILAND, SIR WM. THOMSON AND OTHERS.

During the meeting of the British Association at Bath, the phonograph and graphophone were shown. Colonel Gouraud showed the original phonograph made ten years ago. This "machine" is now kept at the Royal Institution as a curiosity. The Colonel said it was a somewhat cumbersome looking instrument, having a metal drum with a spiral thread round it and on which a sheet of tin-foil was fastened. While it proved that sounds could be recorded and reproduced, it possessed the great defect that when once the record was removed it could not be replaced so as to be repeated. It was only operated with great difficulty and by experts, most persons, as a rule, failing to get good repetitions. During the next 10 years Edison was busily working in the direction of perfecting the instrument, although for the most part engaged with his work on the electric light. In the course of the past two or three years, Edison had devoted more time to the work than before, with the result that he had received a few months ago a telegram from the great inventor communicating the first intelligence of his having arrived at a practical result. The message conveyed the information, "I have perfected the phonograh; it is a darling". (Laughter.) He, of course, awaited with great interest the evidence of this perfection which arrived a few weeks ago at his house at Norwood. Mr Edison's Phonogram, spoken across the Atlantic 3,000 miles away and 10 days before, was heard in his house with perfect distinctness announcing "Friend Gouraud, this is my first mailing phonogram." The present phonograph was smaller in size than the original instrument, although its various parts were not much more numerous. It had the further difference that it was actuated by a motor with a battery. The motor was silent and took an almost infinitesimal amount of current to actuate it. Phonographs were also made to go by clockwork and the others by means of foot propulsion, but the model which Edison decided upon was one on a large scale, not only for correspondence and business purposes, but for the amusement, instruction and education of the family personally. He had used the present phonograph for teaching one of his children, nine years of age, the conjugation of a French verb and another son on whose musical education he had spent a great deal of money, about 14 years of age, had learnt two pieces of music by means of the phonograph. Since the receipt of this machine, which had practically been made by Edison's own hand he had ceased to carry on the correspondence between the inventor and himself in the commonly accepted manner. Ordinary letter writing between them has been superseded. Their correspondence was now recorded on the drum of the phonograph in the shape of "talk," which was carefully enclosed in a hollow cylindrical box, stamped and sent on its mission to the Atlantic. (Cheers.) There were already on the ocean five perfected phonographs better than the model he now displayed. Mr. Edison hitherto had experimented with wax in constructing his phonograms but a telegram had lately been received from the inventor stating that "Wax is out of it," and that another and better material had been discovered which was not affected as wax was by change of temperature. (Cheers.)

By way of illustrating the power of the phonograph Colonel Gouraud caused the record of the sounds which had been produced by the blowing of a cornet in Mr. Edison's laboratory to be again given forth for the benefit of the audience. Amid breathless silence there presently escaped from the wide-mouthed funnel attached to the revolving drum a cornet solo of "The Last Rose of Summer." Notwithstanding the unusual size of the hall for experiments of the kind, every note was clearly heard in all parts, and those near the instrument could hear the deep breathing inhalations at the end of long passages as well as the most delicate and softly rendered variations. It need hardly be added that this performance of the phonograph was rewarded by a unanimous outburst of cheering.

Mr. Henry Edmunds then described the graphophone, claiming that in 1881 Professor Graham Bell, inventor of the telephone, with Dr. Chichester A. Bell, and Mr. Charles Sumner Tainter, formed the Volta Laboratory Association, in Washington, for the purpose of investigating the art of transmitting, recording and reproducing sound, and that they conducted many elaborate experiments, and among other things sought for, and discovered, the cause and the failure of the Edison phonograph. They found that tin-foil, as used in that instrument, was far too pliable for the purpose, as it always had a tendency to pucker and destroy the symmetry of the sound-waves. They perceived that no good result could be obtained by merely indenting a pliable material. It was necessary to engrave a record in a solid resisting body, and this discovery enabled them to produce a really practical instrument, which they termed the "graphophone." Instead of tin-foil, Mr. Tainter employed wax, ploughing out by means of a vibratory stylus a narrow undulating groove, which constituted a sound recorded. When this groove was retraced by another stylus and diaphragm, the original sounds were produced with accuracy.

In the discussion which followed, Sir Wm. Thomson expressed it as being his opinion that Mr. Edison's original phonograph was one of the greatest discoveries in the practical application of science ever made. Whether, he continued, the phonograph was to be of practical value for the purposes which had been described by the lecturer, or whether it was to be considered merely as a scientific discovery, it certainly was an instrument of the most remarkable and valuable character. He believed that this apparatus would give them the means of analyzing sound scientifically and of making discoveries regarding the nature of different sounds which no apparatus thought of previously would have done. He considered it to be one of the most remarkable specimens of inventive genius ever brought before the notice of the world. It was interesting to notice that though Mr. Edison had used tin-foil for receiving the message, he had discarded it in favor of a material which had been used for an almost identical purpose 2,000 years ago—namely, wax. Writing with the stylus on wax was the ancient method of effecting communication by hand; but it had been left until nearly the end of the 19th century for inventors to find out a method of writing on wax by means of the voice, and afterwards reproducing the recorded impressions, although the material itself had been perfectly well known for so many thousands of years. (Cheers.)

Colonel Gouraud in his reply stated that the price of the phonograph had not yet been definitely fixed. On the 3d inst., however, Mr. Edison started a factory for the manufacture of the instruments, the average daily output of which was estimated to produce a total annual produce of 18,000 machines. It was expected that the first of these machines would be placed on the market at from about £20 to £25. Mr. Edmunds had stated in his address that to Mr. Tainter, or the gentlemen connected with the Volta Company, belonged the credit of making the first machine to record and repeat distinctly articulated speech. He could not agree with that statement. Mr. Edison had made the first machine to accomplish that purpose ten years ago. The instrument then made did record and speak distinctly what was spoken into it under the conditions he had previously described. Whatever Mr. Edmunds might know as to how and what that gentleman did, the information so acquired was in no particular superior to his own, because he had derived his information before this gentleman knew anything about what had been done. He did not think that statement would be disputed. He did not think Mr. Edmunds meant to convey a wrong impression, but there was

not in the invention of the graphophone, speaking not only from his own knowledge but on the authority of those who were familiar with all the patents, one single feature, meritorious as the invention was on the whole, which had not been utilized by Mr. Edison during the course of the past ten years.

Mr. E. T. Gilliland, who was introduced by Colonel Gouraud as Mr. Edison's fellow-worker and right-hand man for years past in the perfection of the phonograph, stated that the paper dealing with the graphophone had placed Mr. Edison in a somewhat unfair position. He maintained that Mr. Edison had invented, published and patented all the essential principles that were embraced in the present perfected phonograph.

Mr. Edmunds considered it to be a remarkable circumstance, however, that Mr. Edison should have neglected such a promising child of his in 1879, and turned his attention to the broad and lucrative field of electric lighting. If Mr. Edison had been working at the phonograph for all those years, how was it that he allowed the English patent to drop in 1885?

At this stage the president interposed, says the English reporters, and pointed out the undesirableness of introducing matters which would lead to controversial conflict, and then proposed a vote of thanks to Colonel Gouraud and Mr. Edmunds for their interesting addresses and illustrations. Both gentlemen suitably acknowledged the courtesy; and thereafter, the phonograph and the graphophone held "receptions" in side rooms and were lionized for several hours by constant streams of visitors.

Manufacturing Notes.

The Non-Magnetic Watch Co. of America, has been awarded the gold medal at the Centennial Exposition at Cincinnati, for best watches. These watches contain Paillard's patent non-magnetic compensation balance and hair-spring.

James W. Queen & Co., of Philadelphia, have just issued a very complete and well illustrated catalogue and price list—364 pages—of chemical apparatus, manufactured, imported and sold by them. The catalogue will be sent to all requesting a copy.

The Westinghouse Electric Company, of Pittsburgh, has opened a handsome suite of offices in the Telephone building, 18 Cortlandt street, New York. Mr. D. C. Spruance will make his headquarters at these offices, and the company will continue actively to prosecute its business in the East.

The Keystone Construction Company, of Pittsburgh, has just closed a contract for a 650-light incandescent plant. Westinghouse system, for Mansfield, Ohio. The same company has completed the installation of a 20 arc light plant, Thomson-Houston system, for the Citizens Traction Company, of Pittsburgh.

Three Edison central stations have recently been contracted for by Mr. Geo. W. Silsby of the Edison United Manufacturing Company, located as follows: Mount Holly, N. J., 900 lights; Burlington, N. J., 1,000 lights; Bristol, Pa., 450 lights. At South Amboy, N. J., Mr. Silsby has recently installed an isolated plant of 75 lights for Mr. John Scully, coal dealer.

The works of the Ball Engine Company, Erie, Pa., manufacturers of high speed automatic cut-off engines are crowded to their utmost capacity with orders for their engines. Among their recent shipments are the following:

Denver, Col., Elec. Illuminating Co., two 80 h. p. engines; Seeger & Guernsey, St. Augustin, Mex., one 25 h. p. engine; City of Greenville, S. C., one 100 h. p. engine; Thomson-Houston International Electric Co., Australia, one 60 h. p. engine; Atlantic City, N. J., Electric Light Co., one 200 h. p. engine; Olean, N. Y., Electric Light Co., one 60 h. p. engine; Paterson, N. J., Electric Light Co., three 100 h. p. engines; Paterson, N. J., Electric Light Co., one 80 h. p. engine; Lynn, Mass., Gas Light Co., one 100 h. p. engine; Electric Improvement Co., Santa Clara, Cal., one 80 h. p. engine; Akron, O., Electric Street R. R. Co., two 200 h. p. engines; Electro-Automatic Transit Co., Baltimore, Md., one 100 h. p. engine; Pensacola, Fla., Electric Light Co., one 100 h. p. engine; Danville, Pa., Electric Light Co., one 80 h. p. engine; Brattleboro, Vt., Gas Light Co., one 80 h. p. engine; Walla Walla, W. T., Electric Light Co., one 35 h. p. engine; Thomson-Houston International Electric Co., Hioga, Japan, one 25 h. p. engine; Ada, O., Electric Light Co., one 80 h. p. engine; Blaisdell & Pride, Jacksonville, Fla., one 40 h. p. engine; W. W. Cummer, Cadillac, Mich., one 100 h. p. engine; Paul Kuhnke, Clyde, O., one 25 h. p. engine; City Gas Light Co., Norfolk, Va., one 80 h. p. engine.

A Dog at the Telephone.

A good dog story comes from Manchester. A bright witted girl telephoned to her father at his office, asking if her dog "Curly" was there. Reply came that he was. "Well, take him up in your arms and hold the receiver to his ear; I want to tell him to come home," said the girl. Her father did so. The dog's countenance wore, momentarily, a look of astonishment at hearing: "Come home, Curly; come home!" in the feminine tones of his mistress, but it took him only an instant to understand what was wanted, and, the door of the office being opened, he made a wild break for home as fast as he could go.

The Underground Wire Question in New Haven.

Superintendent Smith, of the fire alarm telegraph, appeared before the committee on underground wires, New Haven, Conn., and advocated placing electric wires in underground conduits. He thought immediate action should be taken in the matter, the reason being that the net-work of wires would greatly endanger life and property in case extensive conflagrations occurred.

Mr. James English said that the Electric Light Company contemplated laying wires in asphalt conduits by way of experiment. As yet no satisfactory system of laying underground wires had been devised.

The Suit to Annul the Bell Telephone Patents.

The telephone case under argument before the U. S. Supreme Court last week, grew out of a suit brought by Acting Attorney-General Jenks in the Circuit Court of the United States for the District of Massachusetts to have cancelled two patents granted Alexander Graham Bell as inventor of the telephone on the ground that the patents were obtained by fraud. The Bell Company entered a demurrer to this suit, in which they maintained among other things that in the absence of any specific statute the United States had no power to maintain a bill in equity to cancel a patent for an invention. The Circuit Court held that this point was well taken, but furthermore ruled that even were the court not to go to this extreme length the demurrer must be sustained on the ground that the main questions raised against the validity of Bell's patents could be advanced in an infringement suit, and that the Attorney-General could not bring a suit to cancel a patent on grounds which constitute a defense in infringement cases. The case comes to the Supreme Court on appeal from this decision.

FIG. 3. FIG. 2.

FIG. 3.—CLOSED SLOT REINFORCED CONNECTOR.

FIG. 2.—OPEN SLOT REINFORCED CONNECTOR.

Among the distinguished attorneys present, besides the solicitor, were Judge Thurman and Hon. Jeff Chandler for the Government and J. J. Storrow and E. N. Dickerson for the Bell Company. Judge Thurman spoke first, and was only interrupted twice, and then by questions of no pertinency as showing the opinions of the Justices. When he took up the opinion of Judge Colt, of Massachusetts, overruling the Government's demurrer, he said that it seemed to be a sin in the eyes of some Judges not to blindly follow the decisions of their predecessors, and this, he said, "seemed to be particularly true in the good old Commonwealth of Massachusetts." "We, in the West," he continued with a smile, "don't think so, and if a Judge renders a wrong decision and another Judge gets a chance to reverse his decision he is very apt to do it."

Judge Thurman in his argument said that the Bell Company conceded the constitutional right of the Government to enact a statute giving the Attorney-General power to bring suit to cancel a patent, but maintained that in the absence of such a statute the Attorney-General had no such power. Judge Thurman asserted that no Congressional action was necessary, that the Constitution gave ample authority for the bringing of the suit, and he declared that Congress could not even by express statute limit this power, for it would thereby abrogate the Constitution.

Mr. Chandler maintained that the right of the Executive to bring this suit was inherent, and that when the Government was wronged by fraud or otherwise in the execution of its laws it had the right by bill of equity to cancel and nullify this wrong.

Mr. James J. Storrow, for the Bell Company, controverted the Government's position and declared that the Attorney-General did not have the power claimed, and that the fact that the extensive legislation in regard to patents made no mention of this power forbade its exercise. He further maintained that everything alleged in the Government's bill could be advanced in an infringement suit brought by private parties. If the power existed in the Government to bring a suit to cancel a patent its exercise should plainly be limited to cases where the statutory defenses failed to reach the case, for to hold otherwise would turn patent litigation largely into the hands of the Government, which evidently was not the intention of the law.

FIG. 4.—FUSIBLE WIRE BINDER.

All the Justices of the Supreme Court sit in this case except Justice Matthews, who is ill, and Justice Gray, who has relatives pecuniarily interested in the Bell Telephone Company. The decision of the Court it is expected will be announced at an early day.

New Electrical Appliances of The E. S. Greeley & Co.

The illustrations on this page are of several new tools and appliances that the ever progressive Greeley Company have just brought out. The pliers are insulated by soft rubber, that slips on or off, and protects the hand of the workman from contact with the metallic handle. This class of tools is coming into quite general use among linemen and other workers in the electrical field. The two connectors and fusible wire binder are all in the line of detail improvement that electric wire and cable workers will appreciate.

FIG. 1.—INSULATED PLIERS.

*** Charles Dressler, an employé of the Chesapeake and Potomac Telephone Company, was near the top of a pole in Baltimore recently, adjusting a wire, when the pole began to crack, snapped at the ground and fell across the street. Fortunately in its descent it became entangled in a number of strong wires on the opposite side, which broke the fall. The man was taken from his perch by some citizens near by not much hurt, but badly frightened.

TELEGRAPHIC

.... New Bedford, Mass., wants better telegraph facilities and her Board of Trade has requested the Western Union to supply them.

.... San Francisco, after repeated heavy losses by fire, abolished her old system of "bell-ringing," and adopted what is known as the Gamewell Fire Alarm. They now claim to have the best and most complete system in the world.

.... Circuit No. 17 of the fire alarm system, in Boston, was burned out last week and the repeater in the dome of the state house was much injured. The cause was supposed to be the contact of a broken electric light wire with wires of the fire alarm system.

.... The annual meeting of the Western Union Telegraph Company was held in New York, Oct. 10, Samuel Sloan acting as chairman. The old board of directors, with the exception of Henry M. Flagler, who takes the place of A. R. Vannes, was re-elected. The annual report for the year ending June 30, 1888, shows: Gross earnings, $19,711,164; expenses, $14,640,593; net earnings, $5,070,571. Payments on dividend, interest and sinking fund account were $4,574,203, leaving a surplus of $476,363.

.... The principal modification of the conduit grant asked for by the Western Union Telegraph Company at Buffalo, is as follows: That the company shall allow a conduit or pipe similar to theirs to be constructed by the city within the same trench for the city's wires. The city shall have the right to connect its conduit with the manholes in the company's conduit, but said manholes shall remain under the exclusive control of the company, and the city shall pay for its own repairs and replacements at actual cost.

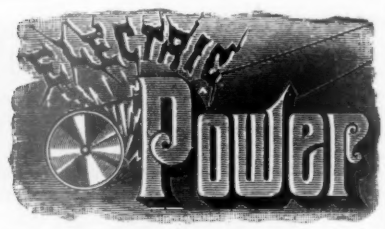
The Drug Store System.

A Chicago druggist told an *Evening Journal* reporter, a few of his telephone woes. He thought it a great nuisance at times, yet said it was so inseparable from "our system that we pay $150 each year for its maintenance. Occasionally people pay for its use, but most of them expect it for nothing. Now, everybody knows what it means to operate a telephone. It not only consumes valuable time, but tries our temper severely, to say the least. Then, people will persist in transmitting such foolish and unnecessary messages. When Barnum's circus was in town, a young man called me up and requested me to walk two blocks to inform his mother that the parade would pass the office where he was employed at a certain hour.

"Recently a young married woman came over and asked me to call up her husband, who was in a down-town store. After considerable delay, during which my vocal cords were exercised to great extent, I managed to make the connection and handed her the ear-piece. You can imagine my chagrin when she asked in a very feeling tone, 'If he had arrived down-town safely,' and 'If he had thought of her during the day.'

"Some time ago a young lady sent a message to be delivered to a young man in this vicinity breaking an engagement of marriage and demanding a return of presents. Last night a man woke me up to telephone to the police station about a lost child, and a little later another fellow came and wanted me to call a doctor, who lives only three or four blocks from here.

"Now I dare say that many people who taunt us with these matters are entirely innocent of intending to cause us annoyance, and this fact makes the wrong more difficult to remedy. For years past these accommodations have been assumed by members of our profession, and the public has been educated to the belief that a drug store can not exist without providing them. As far as I am concerned I can say that it gives me pleasure to accommodate appreciative people with little favors that are within my power, but I strongly object to this monoply of our time without compensation."



The McLean electric railway ordinance is being considered by the Toledo, Ohio, City Council.

The People's Electric Street Railway Company, of Buffalo, N. Y., want to construct, maintain and operate an electric street railway.

President Ives of the Fair Haven & Westville Horse R. R. Co., New Haven, Conn., hopes to have all the cars on the road running by electricity within six months.

The St. Louis Car Company is constructing a complement of cars, under the Van de Poele electric system, for the Newark and Granville Street Railway, of Newark, O.

The Salt Lake *Tribune* says: The street railroad company have not been able to do anything with the Casebolt overhead cable system, as the patents are tied up in a San Francisco lawsuit, and there is no telling when a settlement can be made.

A novel electric railway has been completed, running from the shore of Lake Lucerne over a bed cut in the solid rock to the summit of the Burgenstock, 1,330 ft. up. It has a gradient of from 32 to 58 per cent. The electricity is generated by a water wheel in the River Aar.

The city authorities of Erie, Penn., have granted the Erie Passenger Street Railway Co. the privilege of erecting wires and poles for the purpose of allowing electricity to be used as a motive power in running its cars. Work will be begun soon. The officials of the company have been investigating the various railway motor systems in use in other cities.

At a meeting last week of the Toledo, Ohio, Council, the resolution was approved to accept the bids of the Toledo Electric Company and the Western Electric Light and Power Company to furnish 150 arc lights, each of 2,000 candle power, for lighting the city 365 nights in the year, at $100 per arc light, for a period of five years, 2½ cents per hour to be deducted for every hour that any of the said lights are not burning. A resolution to accept the bid of the Toledo Electric Company for incandescent lights for private consumers at $1 per light, per month, was adopted.

Chicago air is full of elevated, alley, arcade, and underground railway schemes, and in every instance electricity is mentioned as a very possible power for propulsion. If all the projected lines were to be put down to-day, on top of the buncome and flowery speeches that have been made on L roads, rapid transit, and the like, the track would be lifted into the air higher than any kite of the traditional Guilderoy ever flew.

As the barkeeper said to the customer who was looking at the foam on the mug: "The beer is below; that froth can all blow away, see?".

The lake breeze will remove the froth and scum, and Chicagoites shall find the beer after awhile.

The Sprague Electric Road at Tacoma.

During the last week the Sprague Electric Railway and Motor Co., of New York, have closed another and very important contract for the equipment of another electric street railway. This is with Mr. Nelson Bennett, President of the Tacoma Street Railroad Co., for the entire electrical equipment of that street railway. The system will be the regular Sprague overhead, with the small No. 6 wire as a working conductor, which is a feature upon all the Sprague railways.

The cars will all be brilliantly lighted by electricity, will be furnished with all the latest Sprague improvements, and will have the new improved Sprague trolley wheel. The cars will all be protected from lightning by improved lightning arresters of the latest pattern.

Experiments in Proof of the Electro-Magnetic Theory of Light.

In his presidential address before the mathematical and physical section of the British Association, Prof. G. F. Fitzgerald dwelt at length on the recent experiments of Hertz in Germany on the propagation of electro-magnetic disturbances. These experiments are of importance, and go far toward confirming the electro-magnetic theory of light. An abstract of the address is given herewith:

There have been for years two theories with respect to the action upon each other of quantities of electricity, and of elements of electric current. One held that the various phenomena were caused by direct action at a distance; the other, that they were due to the action of the intervening medium. With respect to the electro-static phenomena, Faraday's discovery that the capacity of a condenser varied with different dielectrics between the conducting coatings, made the theory of direct action extremely improbable; and his work, with that of Maxwell, has put the theory of an action of the dielectric on a firm foundation.

With respect to electro-magnetic phenomena, however, the case is different. Maxwell, in his magnificent work on electricity and magnetism, developed the idea that electro-magnetic actions are dependent on the surrounding medium, and one of the results is the electro-magnetic theory of light. But there has been no direct and unquestioned proof that there really is such an action in the dielectric as Maxwell has supposed. To illustrate the fundamental ideas involved, suppose we have a condenser made of two sheets of tinfoil with glass between; and suppose, further, that we have a battery whose poles may be connected to the coatings of the condenser. If we suddenly connect the poles to the coatings, there will be a momentary current, which will last only long enough to charge the condenser, probably for only a small fraction of a second. Now, the general idea was, that there was a current in the battery, and in the wires used to connect it with the condenser; and the result was to charge the two coatings, one with plus, the other with minus, electricity; and there the action stopped. Maxwell's idea was, that the current, so long as it lasted, was perfectly continuous, but that in the glass plate the action consisted of a "displacement" of electricity; that is, considering a number of planes drawn through the conductors and through the glass, perpendicular to the direction of current, the amount of electricity crossing any plane was the same at the same instant, but that in the glass the result was a state of strain, exactly as if a spring were bent. The amount of "displacement" depends on the displacing force—the electro-motive force of the battery. When the proper displacement has taken place, all further action ceases, unless the strain is too great, in which case the dielectric breaks down, and we have the well-known phenomenon of disruptive discharge. The amount of displacement determines the charge of the condenser. When the electro-motive force is removed and the coatings joined, the strain in the dielectric relieves itself, producing the discharge.

If we charge the condenser with an alternating current, we have in the glass continuous displacement currents, first in one direction, then in the other.

From this fundamental idea of looking to the dielectric for the really important part of the phenomena, Maxwell was led to consider the laws by which the vibration of electricity on a small conductor would be propagated in the surrounding medium. He found that the equations governing the propagation were essentially the same as those deducted from the elastic solid theory of light; and he found that the velocity of propagation of such a disturbance was equal to a certain electrical constant which has several times been determined, and which agrees, within the limit of experimental error, with the value of the velocity of light. He also showed a relation between the specific inductive capacity and index of refraction of substances, which has not been completely proved, but which is suggestively close.

Here the matter dropped for a while. The theory has been extended, notably by Rowland and Fitzgerald, to account for other phenomena of light, but no experimental evidence of a conclusive nature has been produced.

It had not been shown, until Hertz's experiments were made, that the vibration of an electric current would set up disturbances in the surrounding medium—the assumption on which Maxwell's theory was based. Hertz proved this in the following way: Conducting circuits have definite time-constants, just as stretched strings have definite periods of vibration; and a disturbance whose period is the same as the time-constant of the circuit will produce a greater effect than any other, just as a piano-string will vibrate if one sings the note to which it corresponds. Hertz produced electric vibrations of a short and definite period—one hundred millionth of a second, of a wave-length of about two metres—and studied the effect on a receiving-circuit of the same time-constant. The receiving-circuit had a short air-space in it, and sparks were observed leaping across this space. By placing the vibrator several wave-lengths from a reflector, and moving the receiver between the two, he observed that at certain distances the induced sparks were faint; then, on moving the circuit, they became brighter, then disappeared again—phenomena exactly resembling Lloyd's bands in optics, due to interference. To quote Professor Fitzgerald: "Henceforth I hope no learner will fail to be impressed with the theory—hypothesis no longer—that electro-magnetic actions are due to a medium pervading all known space, and that it is the same medium as the one by which light is propagated; that non-conductors can, and probably do, as Professor Poynting has taught us, transmit electro-magnetic energy. By means of variable currents, energy is propagated into space with the velocity of light.

The Great Growth of Electric Lighting.

The Thomson-Houston Electric Company report the following new plants, and is a remarkable indication of the great business this company is doing:

Erben Search & Co., Phila., Pa.	50 arcs,	800 inc.
Bennington	35 "	
Brunswick, Ga	70 "	
Belfast, Me	60 "	500 alt.
Columbia, S. C.	60 "	
Hartford Dynamic Co.		500 alt.
Gt. Falls, N. H	100 "	
Rochester, N. H	100 "	
Macon, Ga.	70 "	500 comp.
B. F. Foster, Findley, Ohio.	150 "	
C. M. Strong, Erie, Pa	30 "	
Bath, Maine.	30 "	
Rochester, N. Y	35 "	
Keystone Cons. Co., Pittsburgh, Pa	30 "	
Bay Shore, N. Y.	30 "	
Kennebec Lt. & H. Co., Augusta, Me		1000 alt.
Greenville, Tenn.	30 "	
Knoxville Insane Co., Knoxville, Tenn		400 inc.

The same company also reports the following increases:

Carbon Co., Fremont, O.	100 arcs,	100 inc.
Cleveland, O.	50 "	800 inc.
Boston, Mass	250 "	
Buffalo, N. Y.	50 "	
Montepelier, Vt.		500 alt.
Johnson, N. Y	50 "	
Harrisville, R. I.	45 "	
New Bedford, Mass.	18 "	
North Attleboro, Mass	50 "	
Providence, R. I.	100 "	
Birmingham, Ala.	35 "	800 inc.
Newburyport, Mass.		400 inc.
Gloucester, Mass.	50 "	
Toledo, O	100 "	1000 alt.
Newton, Mass.		1000 alt.
Auburn, N. Y.		500 alt.
Yonkers, N. Y.	35 "	500 alt.
Citizens' Co., Brooklyn, N. Y.	225 "	
Municipal Co., Brooklyn, N. Y.	225 "	
Westerly, R. I.	30 "	
Hyde Park, Mass.		500 alt.
East River, N. Y.	150 "	
Amsterdam, N.Y.	50 "	
Pawtucket, R. I.	50 "	
Worcester, Mass.	35 "	
Augusta, Ga.	100 "	
Cambridge, Mass.		500 alt.
Mobile, Ala.	35 "	
Franklin, Mass.		500 alt.
Nashua, N. H.	45 "	
Milford, Mass		500 comp.
Glen Falls		500 alt.

—— The Camden, N. J., Lighting and Heating Company has purchased from Joseph Campbell for $16,000 the old Lugar mill on Front street below Market, in Camden. The company's present electric light plant will be moved there, and machinery costing $38,000 for arc and incandescent electric lights added.

Additional Electric Light Notes.

—— W. A. Wright, of Greenville, S. C., representing the Brush Electric Co., has sold to the Virginia & Norfolk Wheel Co., Richmond, Va., an incandescent electric light plant consisting of a 75 light dynamo with full complement of lamps.

—— The bids recived by the Navy Department for an electric lighting plant for the U. S. steamer "Pensacola" showed that the lowest bid was that of the Edison Company at $6,000, and the highest that of the Brush Company at $12,287. The Edison secured the contract.

—— The Hartford people are calling for all night lighting of the city. Heretofore the electric lights on the streets have all been turned off at 2 A. M. The Council has passed a favorable resolution, leaving it with the street board to comply with the request if they see fit.

—— The Brush Electric Company, Cleveland, Ohio, have sold to Berry Bros., of Detroit, Mich., through the Brush Electric Light Co., of Detroit, an incandescent electric light plant consisting of an 150 light incandescent dynamo with full complement of lamps.

—— The Common Council at Providence has received a proposition from the Rhode Island and Narragansett Electric companies to place their wires underground, space in the conduit to be also afforded for all of the city's wires, provided that the city would give them an exclusive franchise for a term of years.

—— The Brush Electric Company have sold to Carson Bros., Charlotte, N. C., through W. A. Wright, special agent, an incandescent electric light plant complete. Mr. Wright has also sold to Granite Falls Mfg. Co., Granite Falls, N. C., an incandescent electric light plant complete consisting of 225 lights.

—— The Easthampton, Mass., Electric Light Co. has contracted for an electric light plant and will be prepared to furnish 24 arc lights for the streets. A portion of the current can be switched from the wires for incandescent lights in stores, factories and dwellings. The Waterhouse Co. will furnish the apparatus.

—— The sub-committee of the electrical committee of Councils, Philadelphia, having under consideration the ordinance of the Frankford Avenue Merchants' Electric Light Company, has acted favorably on the bill. The latter gives the company permission to lay their pipes to conduct the electric light wires under all intersections on Frankford avenue between Norris street and Lehigh avenue.

—— The Water Works and Electric Light Company, of Greenville, Texas, has just perfected its organization under its charter recently obtained from the State, by the election of J. M. Cook, as its President; Thomas Howard, of St. Louis, is Vice President; and F. B. Nichols, also of St. Louis, Secretary and Treasurer. Deeds have been executed and delivered from the city to the company for the main water works site.

—— At a meeting of the incorporators of the Beaver Valley, Pa., Electric Light and Power Company, held last week, the following officers were elected: H. W. Hartman, chairman; S. D. Hubbard, secretary; John Reeves, treasurer; J. M. Buchanan, solicitor. The Board of Directors are H. C. Fry, J. P. Sherwood, J. M. Buchanan, S. D. Hubbard, H. W. Hartman. The company are now ready for business and will have the plant in operation in five weeks.

—— The Consolidated Electric Lighting Company, Portland, Me., have greatly enlarged their plant to accommodate the rapid increase in their business. They have just finished putting in two new engines and dynamos which have a capacity to supply 800 incandescent lamps. These the company will keep in reserve to be used either on the night or day service as may be required. A new day service was started, running last week, on a circuit of 350 incandescent lamps. They are used in basements and other places where but little daylight is to be had. The day circuit is capable of supplying 500 lamps, and can be added to from the spare dynamos at any time.

NEW ENGLAND NOTES.

Mr. C. J. H. Woodbury, of Boston, is to read a paper this week on "Electric Welding" before the American Society of Mechanical Engineers, which holds a session at Scranton, Pa., Oct. 15 to 20.

It is rumored that the Excelsior Electric Company is shortly to establish an office in Boston to be devoted exclusively to the motor branch of their business.

The New England agency of the Mather Electric Company is making an excellent showing in the matter of new installations and increases of existing plants. Among their recent contracts are one of 300 lights for the Wachusett Shirt Company, Leominster, Mass., an increase of 100 lights for Rumsey Bros., Mansfield, Mass., 150 lights for the British Hosiery Company, Princeton, R. I., and an increase of 100 lights for the Providence Machine Company, Providence, R. I.

The Sawyer-Man Electric Company have contracted, through their Boston office, for the following plants during the past week: William Knowlton & Sons, West Upton, Mass., 400 light plant; Heywood Bros., Gardner, Mass., 600 light dynamo; George W. Phillips, Norwich, Conn., 50 light dynamo; Westbrook Manufacturing Company, Saccarappa, Me., 400 light dynamo.

The New Thomson-Houston Offices in Boston.

(By Long-Distance Telephone to the ELECTRICAL REVIEW.)

The second floor of the John Hancock Building, on Devonshire street, presented a scene of great activity on Saturday, when the Thomson-Houston Electric Company undertook the task of removing their offices to the new Hathaway Building, 620 Atlantic avenue, foot of Summer street. The work was nearly all accomplished in one day, and considering its magnitude, reflects great credit on Mr. Davis, of the supply department, who had the matter largely in hand. The Hathaway Building is of elegant design, and the new offices of the Thomson-Houston Company are very pleasantly located on the second floor. The corner office, having a north and south exposure, is occupied by Mr. C. A. Coffin, vice-president and treasurer.

Captain Eugene Gifford, manager street railway department, of which Mr. G. W. Mansfield is the electrical engineer, assisted by Mr. Winthrop Coffin, occupies the large offices facing Atlantic avenue.

Mr. G. W. Davenport, manager of the International Company, and Mr. S. T. Peck occupy the adjoining offices. Back of Captain Gifford's is that occupied by Mr. E. I. Garfield, secretary of Thomson-Houston Company. Mr. W. M. Tate and Mr. J. C. Selton have pleasant quarters adjoining the departments of advertising and printing, in charge of Mr. H. B. Prindle. The main office in rear contains nearly 100 feet of desk room, which will prove none too much for the bookkeeping department, which is to be occupied under chief bookkeeper Mr. E. M. Daley. A glass partition separates off a convenient space for the company's various agents.

A supply department, in charge of Mr. E. D. Davis, has quarters in the extreme rear, as has also the departments of engineering and mining, under Mr. Patterson. Mr. Clapp, the attorney, has an office near the entrance. The company's incandescent lighting system is used throughout the building. The cypress wood finish makes the offices particularly attractive, and the electric bells, speaking tubes and call annunciators furnish every convenience, making altogether an attractive and well arranged office suite. The Thomson-Houston Company have in their Boston offices something of which not only they themselves, but all electrical people, may feel proud, and is a striking proof of the wonderful growth of the business in the past few years.

Boston, Oct. 16th. T. W. S.

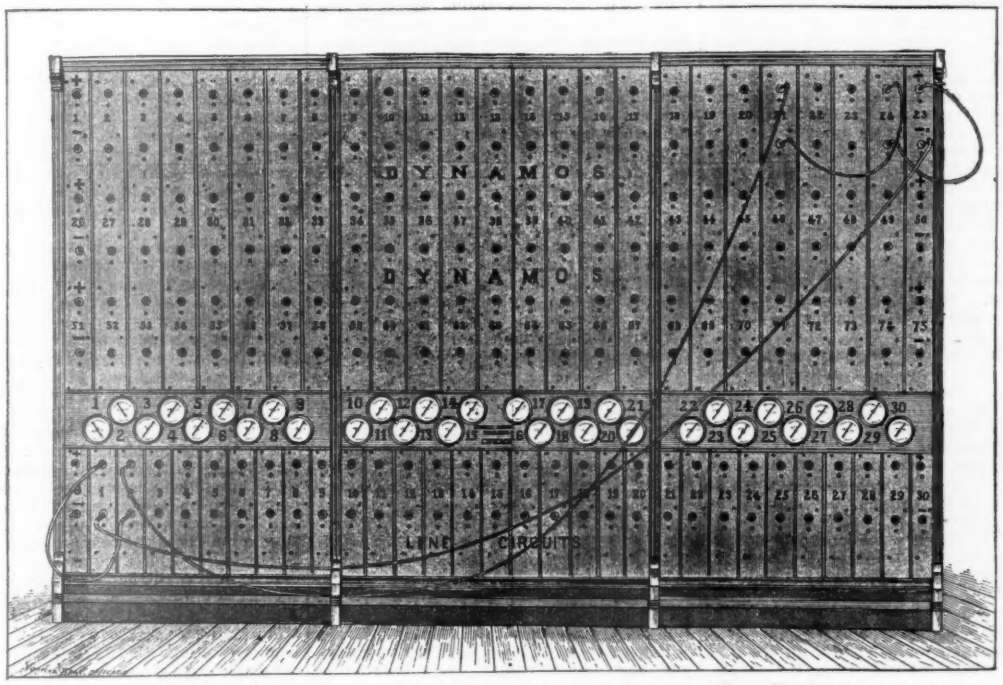
An Arc Light Switchboard.

The switchboard of an arc light plant is as necessary an adjunct as are the insulators, and should combine all the elements of safety, convenience and durability, while its arrangement should be such as to permit of readily connecting any generator with either of the lines running to the station. So too, as being a better and more reliable method of getting at the condition of current flow than to guess at it by optical comparison, an ammeter should be conveniently located on each circuit, and this should be directly at the switchboard; in fact a part of it.

These ideas are well combined in the switch board illustrated to-day, which has just been constructed by Mr. Foree Bain, of Chicago, for the Louisiana Electric Light and Power Company of New Orleans. Its dimensions are 12 feet high by 21 feet long, and it has a capacity for 75 dynamos and 30 circuits with 3,750 arc lights. Each circuit has an ammeter and each is provided with fusible strips on either side, connected with a lightning arrester.

The board is made of well seasoned cherry, and special pains has been taken to avoid the possibility of danger in switching. There is no metal upon the face of the board, and once a plug is placed for insertion the hand cannot come in contact with the metal, and on the back of the board, which is arranged to be easy of access, the wires are attached permanently in a dust proof cupboard; a part of the board proper, and terminate in lock spring jacks which firmly hold the plugs. These latter have a harpoon shaped tip, and enter from the face of the board through rubber bushed holes. All the wiring of the board is done with okonite cable. The switching plugs have hard rubber insulating handles, and each spring jack has openings for two plugs, so that a temporary plug can be inserted to the end that changes may be made without opening any circuit. To withdraw any plug it is necessary to make a quarter turn, so that the accidental dropping of one of these is impossible. All connections are ample for 100 amperes of current.

The dynamo wires enter the board from the top, while the line wires come in from the bottom, and are all firmly connected through bolts and washers with check nuts. Taken all in all it appears to be one of the largest as well as most perfect of this class of apparatus manufactured.



ARC LIGHT SWITCHBOARD FOR THE ELECTRIC LIGHT COMPANY, NEW ORLEANS.

The annual meetings of the Massachusetts and Boston Auxiliary Fire Alarm Companies were held last week, and business of importance was transacted. An idea of the rapid spread of the business may be gathered from the fact that in Boston there are to-day 1,200 push button auxiliary stations. Over 100 school houses have been equipped with the Rogers auxiliary system.

Professor George Forbes, F. R. S., in an address delivered before the British Association, England, Sept. 10, 1888, said: "The wiring is nearly all overhead in the States. The Simplex wire, made by a firm in Boston, is very carefully prepared and is, I think, beginning to be known in this country, and gives satisfaction."

The Boston *Advertiser* will print this week an elaborate article on electrical progress and development, under the heading "Harnessed Lightning." It is from the pen of Mr. S. Fabyan, for a long time editor of the *Commercial Bulletin*, Boston.

Applications are in for the introduction of the Fort Wayne Jenney system of arc and incandescent lighting in Rockland, Thomaston and Camden, Me.

The electric light company, Milford, Mass., is putting in 42 new lights at the Elastic Fabric Company's mill at Hopedale.

Bath, Me., has a new wire going up for incandescent lighting.

Woburn, Mass., is to have a new building for the use of the electric light company.

The Springfield station will be removed this week to the large and commodious building recently erected on the gas company's land. Two new dynamos will be added to the plant, and 17 new street arc lights put in operation.

—— The Northampton, Mass., Electric Light Co. expects to have the addition to its quarters, on Masonic street, completed in about six weeks. It has received its new incandescent light dynamo and will furnish residence lighting about December 1.

—— The officials of Kinderhook, N. Y., are discussing plans for lighting the town by electricity.

—— In the Washington Monument there are two lamps on each landing up to the 200-foot level, from there to the 490-foot level four lamps, and after that one lamp. These are maintained by a dynamo in the engine house run by a small 10-horse power engine.

ELECTRIC LIGHT NEWS

—— The Athens, Ga., Manufacturing Co. are arranging to light their factory with electricity.

—— A new Westinghouse dynamo has been received at the electric light works in Troy, N. Y. It will supply a power sufficient for 650 lights.

—— The Kansas City, Kan., Electric Light Company are to erect a new building for their plant.

—— The West End Electric Light Company of Manchester, N. H., will put in at once 200 electric lights to burn all night.

—— Henry Adams, Rockville, Mass., is putting a dynamo in his mill to run 150 sixteen candle power incandescent lamps.

—— The California Electric Light Company of San Francisco, Cal., has put a plant in the Spreckels sugar refinery at Watsonville.

—— The Electric Light Company of Westerly, R. I., has decided to operate another 30 light arc dynamo, in addition to the one now in use.

—— During the nine months of 1888 there was established in the Southern States, 122 electric lighting plants, as against 53 for the same time last year.

—— The Gas Commission of New York City has ordered the Commissioner of Public Works to light the new Gansevoort Market with electric lights.

—— The Babcock & Wilcox Company, of this city, have built a 1,500 h. p. boiler for the Electric Light and Power Company of Melbourne, Australia.

—— Aberdeen, Miss., is to have electric light. The Thomson-Houston Company have the contract and will put in a 25 arc and 500 incandescent plant.

—— The *Ledger*, of Philadelphia, favors having the city own its electric light plant. Politics and electricity seem to be coming quite generally mixed the country through.

—— The Electric Light Company of New Brighton, Pa., propose to suspend six arc lights on Broadway, if the Council agrees. The company propose to go to work at once.

—— Mr. C. H. Phinigy and others, of Augusta, Ga., having formed a Thomson-Houston Electric Company, will erect a plant. They have a capital stock of $50,000 paid in.

—— A company has been formed to manufacture electric locomotive headlights at Sparta, Ill. It will use natural gas as fuel. The projectors are purchasing machinery in this city.

—— The Hotel St. Louis at Duluth, Minn., is now lighted by Thomson-Houston incandescent lamps, some 800 lamps being used. Mr. John G. Buick superintended the installation.

—— The Thomson-Houston International Electric Lighting Company is sending out an incandescent lighting plant for a mining establishment in the Andes, 14,700 feet above sea level.

—— At Slater, Mo., October 8, an election was held to decide when an increase tax should be levied for the purpose of putting in electric lights, and was carried by an overwhelming majority.

—— The Board of Supervisors of San Francisco, has directed the California Electric Light Company to construct a 40 foot mast with a 2,000 candle-power lamp on the corner of D street and Seventh avenue.

—— The Mt. Morris Electric Light Company now operates, from its station at Mt. Morris, electric lights at the Battery, New York, a distance of seven or eight miles. "K. K." wire, of Holmes, Booth & Haydens make, was used.

The Cincinnati Electrical Society.

THE FIRST PUBLIC MEETING, OCTOBER 9TH. ADDRESS ON "ELECTRICAL EDUCATION," BY DR. OTTO A. MOSES, OF NEW YORK.

The meeting of the newly-formed Electrical Society of Cincinnati, held Tuesday evening, October 9th, was well attended. After the addresses by Mr. A. R. Foote, Dr. Otto A. Moses, Prof. Thos. French, Jr., University of Cincinnati; Pres. E. D. Warfield, Miami University; Prof. Henry Snyder, Miami University; Hon. Job E. Stevenson, of Cincinnati, the ladies and gentlemen enjoyed an elegant supper at the Palace Hotel.

President A. R. Foote, of the Electrical Society, in his opening address, first spoke of the electrical industries of Cincinnati, and of the extent of electrical work in the country generally, quoting from President Duncan's address before the National Electric Light Association. Continuing Mr. Foote said:

Electricity, the most subtle, the most incisive, the most powerful, of all natural agencies, marks with surest designation the limitations on its uses.

Its imperious demand is "Comply with the natural laws by which I am governed and I will serve you with tireless, sleepless, harmless energy. Disregard those laws, and I will destroy you instantly. No plea of ignorance of my laws will avail to arrest the execution of the judgment I decree against those who fail to obey them."

In this industry, more than any other, intelligence alone is the pioneer and guide of progress. Electrical education is the foundation of all its enterprises.

To-day there is not a person whose interests are not in some way touched and served by the use of electricity. There is not an occupation, in which human intelligence and strength is employed, that cannot be made easier by the use of electricity, and pleasanter for the worker, and more productive for the investor.

For this reason, in its true scope and meaning, electrical education means the education of the people.

1st. The working man must be educated that he may devise, produce and operate apparatus that is best for its purpose.

2d. The investor must be educated to enable him to know the value of investments in the various undertakings in which he may become interested.

3d. The public must be educated to enable the people to use the apparatus designed for their service intelligently and without fear.

4th. The law-making representatives of the people must be educated to enable them to legislate properly on all subjects touching the legal regulation of the uses of electricity.

The uses of electricity are limited only by the want of intelligence in producing fitting apparatus for its application. The demand for such apparatus is limited only by the want of intelligence on the part of the public to know how to use it properly.

No other industry ever in so short a time called into its service as much intelligence, as many workmen and as large a capital as this.

Employing the most powerful and destructive known agent, distributing its force by a net work of wires all over great cities, where it has established millions of points of contact with the people, its work being done necessarily by uninformed workmen using untried material and untested apparatus, its record for safety in use is to-day a challenge to all competitors.

This being a fact, it is an educational duty to let it be known and thus destroy the occupation of uninformed or interested sensational writers, who are constantly playing on the fears of the people by writing learnedly about the "death dealing wires."

Recently our city papers startled the public with an announcement of the awful death of a painter by a shock from an electric light wire.

This was put in large letters, and the fact that he had heedlessly and unnecessarily taken hold of the wire was put in small type. I found 15 other *casualties*, reported in the same paper, and not one of them announced in a way to throw the slightest blame on the agent doing the injury.

Mr. Foote quoted at length from Mayor Hewitt's admirable address before the National Electric Light Association, and concluded as follows:

We want for our society: $500 for a library, $500 for a room and its furniture in which to keep our library and establish our home, $500 for the services of a competent person to take charge of the same, and $500 for sundry expenses, making in all $2,000, for our first year. Our membership entrance fee is $3, the annual dues $6, making $9 per year income per member. 225 memberships will create the full amount of the fund desired. Any person interested in our work, lady or gentleman, will be welcomed as a member.

One of the most practical lessons I ever received was given by my employer when I first entered business life. He said: "*Never attempt to invent a thing you can find ready made.*" That is good in itself, but had he stopped there it would have been like a charity sermon without the collection—barren of results. He did not, he gave me ample opportunity to find out what was "ready made" in the particular line in which he employed me.

In our industry, more than in any other, employers can serve themselves to no better advantage than to afford their employés ample opportunity to find out what has already been done. I think I am right in affirming that if all the money that has been wasted in needless experiments in the electrical business, had been applied to educational purposes for the workman and to the increase of their pay, as their intelligence rendered their services more valuable, it would have been sufficient to have provided all that it is possible to provide as a means of education, and to have doubled the wages of every workman receiving the benefits of the education.

The time will come when, as a matter of business policy, capital will seek to insure the success of its enterprise by educating workmen for the work they are expected to do, as it now insures itself against loss by fire or other calamity.

In the electrical business there is no greater calamity to be feared than the uninformed workman. He is a producer of calamities.

I say to all employers, especially to those employing men in electrical work, there is no use that you can possibly make of the same amount of money that will give you as much satisfaction and as good return on the investment as the little necessary for you to employ to educate the workman associated with you for the work you want them to do. I say to all workmen, and especially to the members of this Society:

If there are difficulties in the way of your advancement remember it is a law of nature as well as an axiom in philosophy that "A man acquires the strength of the difficulties he overcomes." Strive to develop your capabilities to their utmost capacity and be true to the best there is in you.

Remember that he whose brain directs with greatest skill, whose hand handles with greatest certainty the tools of his trade, makes them his servant, and works with least effort. More than this, by skill of brain and skill of hand he makes capital his servant also.

Learn to use the language of action; prompt, united, intelligent action and you will render yourselves invincible. A word is a sound in the air. An act is a fact in history. A fact is an epitome of God.

If God made you, He meant you. If He has given you work to do, that it is His work that you are doing, and His work is divine. Show your respect for yourself in the work you do. If that is an honor to you, then the universe shall do you honor.

Mr. Foote then introduced Dr. Otto A. Moses, of New York, who spoke as follows:

Members of the Electrical Society, ladies and gentlemen: That very flattering introduction has touched me, and I do not know what better I can do than adopt for my text a most pregnant sentence from the gentleman's address, one which struck me as he gave it, and I will read it to you again: "The uses of electricity are limited only by the want of intelligence in producing fitting apparatus for its application. The demand for such apparatus is limited only by the want of intelligence on the part of the public in knowing how to use it properly." I do not think I could have had a more fitting introduction to the subject which has been selected for me to address you upon to-night than this thought.

The only limit to the use of electricity is the want of intelligence in making apparatus for its application—the demand is only limited by the want of intelligence on the part of the public. The function of this society, as I understand it, is first, to enlighten ourselves, and secondly, by a re-action, to enlighten the public.

You have not far to go in the history of this world, to begin the history of electricity; some of the very first steps that were taken in it, and some of the greatest, were made by one of our fellow-countrymen.

A lot of apparatus had been sent over from England by a Philadelphia gentleman, a member of the Royal Society, to Philadelphia. Benjamin Franklin received it, and receiving it, he did not know exactly how to utilize it to the greatest advantage. His whole object in life was, as you know, to turn everything to some purpose of utility. In order to make this apparatus available, he founded a society very similar to this which you are about organizing to-night, or have organized.

The outcome of that society was through the work of Franklin principally, but he also found coadjutors in some of the (fundamental) workers in the science of electricity.

The apparatus consisted of a small electrical machine; two or three insignificant leaden jars; very small phials and some glass rods; that and the few notes coupled with it, that came over in the apparatus of the Royal Society, were all the material they had to act upon. It was not long before Franklin developed those laws, and studied them, which are now known to be fundamental. I cite that case to show how a spirit such as actuates you now, can bear the most abundant fruit.

I will cite another instance: About the year 1825, there was a young man of humble parentage and what is far greater than birth, of humble mind—Michael Faraday, of the same stamina as Franklin. He was incited to action by attending a lecture on the subject of electricity given by Sir Humphrey Davy. He immediately gathered together a few friends and formed what was known as the "Philosophical Society," in London. They made their experiments as Franklin had. Faraday, who was characterized by the class poet, as the "philosopher ingrained" conducted these experiments. It is said that he used to put the kitchen table in a prominent place, putting the cat on one side and the dog on the other, and would then address them on the subject of electricity; that was the first beginning of that society which afterwards budded and bloomed, and from which have come several distinguished men, none more distinguished however than Michael Faraday.

Now you have there a very pleasant retrospect. You have that much gained—you have all the wealth of knowledge that is contained in the works of these two men, with hundreds of others, and to you belongs now the action and the opportunity to further carry forward what they have done. I know no better way of doing it than by imitation. Science, moral, political and social, depends upon evolution. You gentlemen to-day, in all your seeming humility in organizing a small society, have back of you and in you a knowledge which at first may not be apparent to you, but which is your heritage—the thing for you to do now is to utilize it to the utmost. Life is very short—science is like art—very long. The tendency of the age is to specialize, and you gentlemen in forming an Electrical Society, think that branch of science enough to cultivate. I would in the very beginning try to eradicate that idea from your minds. All science is interwoven.

I would say to the gentlemen forming this Society that they should pursue certain plans (if they wish to make this Society as useful as it can be), in first storing their minds with all the information that is necessary for the proper explaining of what exists. This power of electricity which incites action, is so simple, furnishes you with admirable opportunity for the propagation of force. Force of any kind is interchangeable and you must study in the present mechanical applications of electricity, what relation it may bear upon the propagation of force in all its forms. Let me say in parenthesis that electricity, of which I know not the cause, beyond the great first cause, contains in it the most wonderful form of power that can be imagined—for this reason: it is not produced until it is wanted. All other forms of energy that we apply have to be stored. Electricity may also, in a way, be stored, but it is a force that may be applied at any instant, and in its application only is produced.

I was at the *Herald* Building recently, and saw one of those great thundering presses turning out countless thousands of papers, with the regularity that only a printing press has. In the center of every machine there was a light like this, and as the machine moved, the light went with it, always with it, and if the slightest accident had happened, it would have been possible to detect it in a moment—10 minutes interruption in the printing of the New York *Herald* would cause them not to be able to distribute their paper throughout the country. Things have to be managed with such absolute accuracy that the press room is like a military ward; you see men standing at the post; speaking is forbidden—every eye waiting for it to break.

Now let us carry that simile further. Instead of being compelled to connect these engines, these presses with belting that may be thrown off from a pulley or gearing that might break, it is put in direct connection with the machine itself. The printing press and the electric machine being one, does that not mean the remodeling of the whole printing press system? I have a friend who is foreman in one of the largest printing establishments in the country, a man of considerable electrical attainments, and he is all the time harping on the possibility of making an electric press.

Two or three days before I left New York a gentleman, a mechanic of great ability, said that he had enjoyed an hour stolen from his work, in which he had witnessed the operation of a type-setting machine. He said the type would rise up, and something would fling it across the room—he saw no power by which the type was drawn; it seemed to work automatically. Here, now, was a machine making and setting type, without any apparent machinery about it.

Quite recently I saw a steam engine with a dynamo machine attached to it—it was a steam engine, and built in it a dynamo—I could not tell where one began and the other ended, but there it had struck the mind of the inventor that a steam engine could in its very birth, have in view the production of light. I prophesy that the day is near when every steam engine is going to be in some way connected with a dynamo machine, because after you have a steam plant, there is very little difficulty in utilizing more of the stored energy in the production of light—and light is so costly a thing when sold—so it will be to the advantage of every steam engine to have its own dynamo machine. Let that be constantly before you—that in the production of your engines you may also couple the dynamo with them.

You should make this electrical society the means of self-improvement among you; that is to say, if any one of you has an idea in an electrical direction, bring it before the society—do not hesitate to do that.

I never look at one of those incandescent lights without a feeling of awe. I had the pleasure of seeing the first one of these lights at a meeting of the Mining Engineers, in Philadelphia, in 1881. I grew up in it, had my hands in it, but I never lose my respect for it. I never can look at that silent word of God without that feeling of awe, and I thank God that I have that sensibility that I can take pleasure over and over again in seeing so wonderful a manifestation of His power.

You are very fortunate, gentlemen, in organizing your society at a time when you have in your beautiful city so excellent an exposition as the one I visited this afternoon, and I visited it with great pleasure, I assure you. I think it a liberal education to have studied that exposition. You have a great advantage there—study all the things that are in it, and you will find one of these days some means of applying your electrical knowledge in connection with it.

The one defect to-day in the telephone system is the fact that two individuals cannot throw themselves into communication, there must be the intermediary of the central station; that will be obviated within certain districts, as to cities—that is going to come, and I give that as a thought upon which you can spend a great many useful moments in developing a way by which you can communicate with any other individual in the circuit.

Now that the central station is a necessity let me show you an application of it. Suppose I wish to be thrown into communication with some person in Atlanta, Ga. I know that that person is going to Atlanta, don't know that he is there, have not seen him for a month, but when he does get to Atlanta I want to talk with him. I immediately telephone to the central station in this city. "Please communicate to the grand central station of the United States" (wherever it may be, say Cincinnati), my wish to meet Mr. A. and be thrown into communication with him when he reaches Atlanta. The central station here telephones to Atlanta, and says, when Mr. A. presents himself at the station please throw him into communication with Mr. B. in Cincinnati or New York. Mr. A. goes to the first telephone station and registers himself, and finds out that I am asking for him. He rings me up directly from Atlanta, you know, and we get into communication. Now you can readily perceive that with the use of the long distance telephone such a state of affairs can be brought about in a few years.

I look to see the day very shortly—I am surprised that it is not now here—when the city of Cincinnati will be ablaze with electric light. I admired your beautiful city to-day when I walked through it for the first time, saw magnificent blocks of buildings, wide streets, a busy population, lighted by gas. I thought to myself, when you consider the enormous development that this electrical industry has taken in other cities, that you are either too timorous or that you have not been brought to understand the value of this new force, of this new manifestation of the force. I know the intelligence is here. I see by this assemblage a desire to burst these bonds or trammels under which your intellects and capital have been held for so long a time, while other cities have been developing both.

The night before I left the city of Pittsburgh, I wandered through the streets of that town with a friend, and I was amazed to see the enormous development of electricity. I recall having been there four years ago, and it was in about the same condition that Cincinnati is to-day. I look to see next time, or perhaps before I next visit you, that you will have taken steps in the direction towards the use of this wonderful power, and that you, gentlemen of the Electrical Society, will have been the means, by your efforts, largely to have enlightened the population of this city.

The greatest manifestation of force which God has given to us, which more than anything else of His handiwork resembles Him, is electricity. Take that and utilize it, and look upon it as the coming means of changing the civilization of this age. You have, gentlemen, a great deal of the future in your hands if you only utilize the means. It is a subject of very great interest and I am glad you seem interested in it, and I hope what I have done in my feeble way will be carried forward.

ELECTRICAL PATENTS

(Copies of any Patents in the following List will be sent to any address on receipt of twenty-five cents.)

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING OCTOBER 1, 1888.

390,612 Mechanical telegraph; John B. Bennett, Indianapolis, Ind., assignor, by mesne assignments, to Alban Andren, Beverly, Mass.

390,674 390,677 Galvanic battery; David Humphreys, Cincinnati, Ohio

390,721 Dynamo electric machine; Nikola Tesla, New York, N. Y., assignor to the Tesla Electric Company, same place.

390,741 Insulator or bracket support for electric wires; Thomas E. Adams, Cleveland, Ohio.

390,748 Battery electrode; Horatio J. Brewer, New York, N. Y.

390,778 Electric bell pull; Philander A. Harris, Paterson, N. J.

390,795 Electrically operative lock. Gustave S. Neu, New York, N. Y.

390,802 Telegraphy; F. Jarvis Patten, Fort Sidney, Neb.

390,820 Regulator for alternate current motors; Nikola Tesla, New York, assignor to the Tesla Electric Company, same place.

390,833 Hotel signaling system; Albert Barrett and Joseph Zentner, Kansas City, Mo.

390,846 Globe for electric arc lamps; William W. Downing, Peoria, Ill.

390,891 Electrical stop mechanism for knitting machines; Andrew M. Newlands, Preston, assignor of one-half to Adam Warnack, Galt, Ontario, Canada.

390,903 Incandescent electric lamp; Albert L. Reinmann, Pittsburgh, Pa., assignor to the Westinghouse Electric Company, same place.

390,904 Electro dynamic motor. 390,905 Electro dynamic machine. 390,906 Multiple current electric generator; Elias E. Ries, Baltimore, Md., assignor, by direct and mesne assignments, to Ries & Henderson, same place.

390,910 Coupling dynamo electric machines for electrical distribution; Oliver B. Shallenberger, Rochester, assignor to George Westinghouse, Jr., Pittsburgh, Pa.

390,911 Regulator for electric translating devices.

390,912 Apparatus for synchronizing alternate current dynamo electric machines; Oliver B. Shallenberger, Rochester, assignor to the Westinghouse Electric Company, Pittsburgh, Pa.

390,921 Carbon contact or commutator brush; Charles J. Van Depoele, Chicago, Ill.

390,930 Synchronizing electric generators; Geo. Westinghouse, Jr., Pittsburgh, Pa., assignor to the Westinghouse Electric Company, same place.

390,955 Dynamo electric machine; Julius Emmner, Jr., Washington, D. C., assignor of one-half to Joseph A. Settle, same place.

390,990 System of electrical distribution; Oliver B. Shallenberger, Rochester, assignor to the Westinghouse Electric Co., Pittsburgh, Pa.

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5 Ball Engines, 10"x12", 60 H. P., 4 years old.
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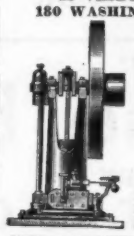
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The injunction restraining me from the manufacture and sale of *PORCELAIN* electric burners for multiple gas lighting, obtained by A. L. Bogart in a suit instituted by him for an alleged infringement of Patent 119,561, *HAVING BEEN DISSOLVED BY REASON OF THE EXPIRATION OF THE SAID PATENT,* I am now making my latest burner of *PORCELAIN* as well as of *LAVA.*
My *FRICTIONAL ELECTRIC MACHINES* embrace the latest improvements in construction and design, and are the only ones now offered to the trade that are protected by *existing* letters patent.
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FRESH TESTIMONIALS TO THE SUPERIORITY OF
SIMPLEX WIRE.

THE VIRGINIA ELECTRIC LIGHT & POWER COMPANY, OF RICHMOND, VA.
NEW YORK OFFICE, 63 WALL STREET.
New York, August 21st, 1888.
A. F. MASON, Esq.,
SIMPLEX ELECTRICAL CO.,
Boston, Mass.
Dear Sir:
I have been using the Simplex Wire on a large portion of our lines in Richmond, Va., for the past five months. I have taken daily tests of the insulation during that time. The longest single circuit I have is about five miles, and at no time has the insulation test ever been less than one megohm. I cannot speak too highly of the wire or its insulation. A large portion of it has been run through foliage and trees in the streets, and upon examination a few days ago I failed to find any place where the wire has been abraded by coming into contract with the branches of trees. My instrument does not measure over one megohm, and I cannot tell how much higher the insulation may have measured. One megohm on wires in circuit is enough for me.
Yours very truly,
W. H. COLE, *Superintendent.*

THOMSON-HOUSTON ELECTRIC CO.,
AUGUSTA, GA.
August 19th, 1888.
Dr. A. F. MASON,
SIMPLEX ELECTRICAL COMPANY,
328 Washington St., Boston, Mass.
Dear Sir:
We are using in our arc-lighting circuits about twenty (20) miles of your Simplex T. Z. R. wire.
We have feund the insulation a most perfect protection against moisture and the abrasion of small tree limbs.
Have used your wire in our station, for running through trees, on buildings and porches, under mouldings, etc., and through cellars, and we have never been able to discover a "ground" upon any circuit since our plant was put into operation.
Very truly yours,
JOHN H. WATERMAN.

ADDRESS,
The Simplex Electrical Co.,
328 WASHINGTON STREET, BOSTON, MASS.

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Speed of Engine, revolutions per minute, 260
Speed of Dynamo, revolutions per minute, 1400
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